THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVIII. No. 1999.] LONDON, SEPTEMBER 3, 1901. [53RD YEAR. PRICE 6d.

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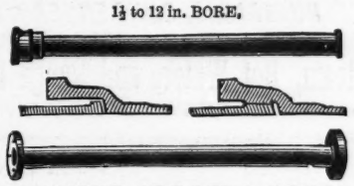

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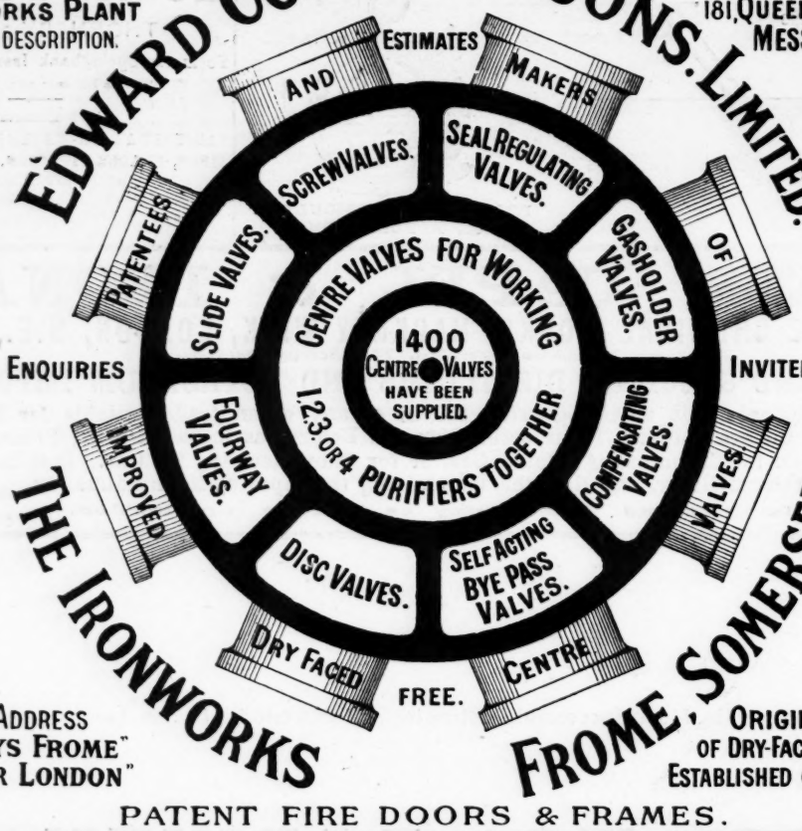

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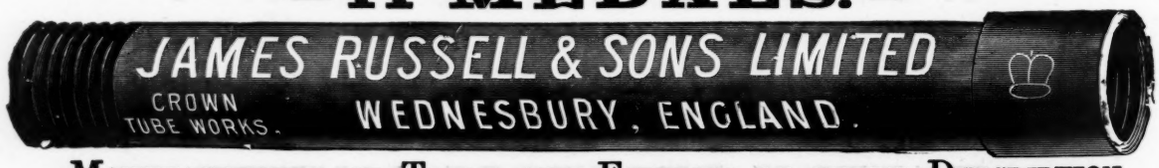

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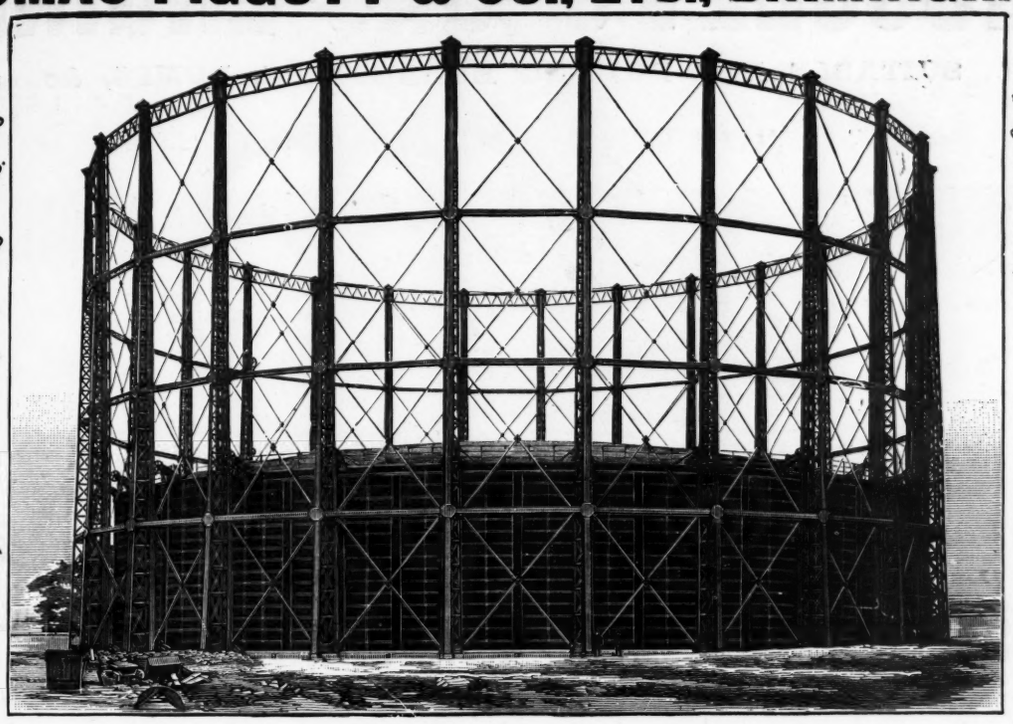

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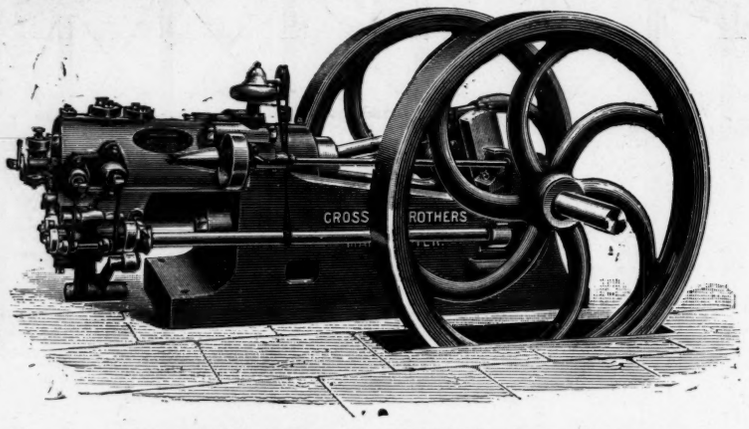

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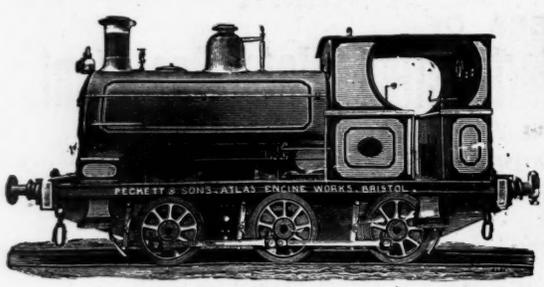

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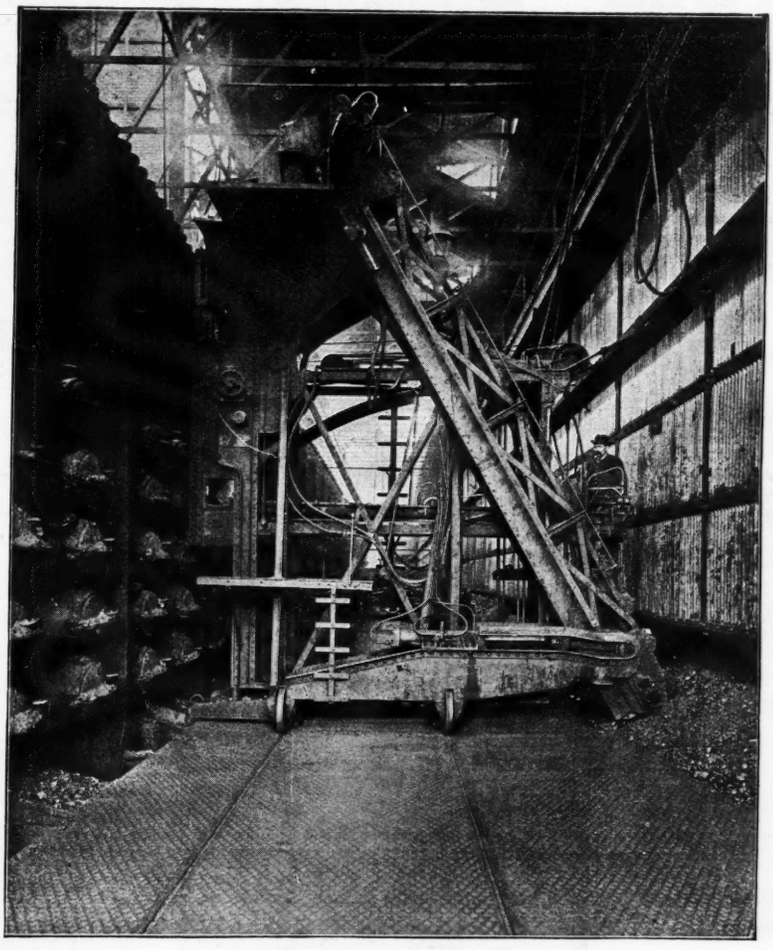

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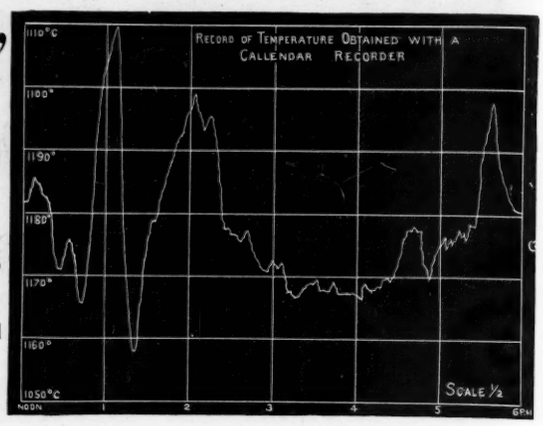

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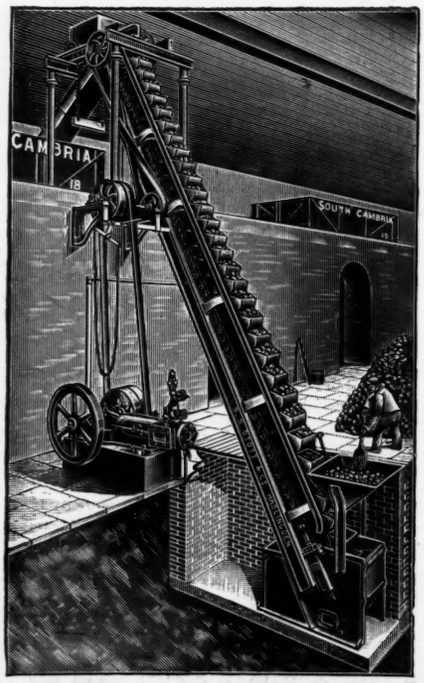

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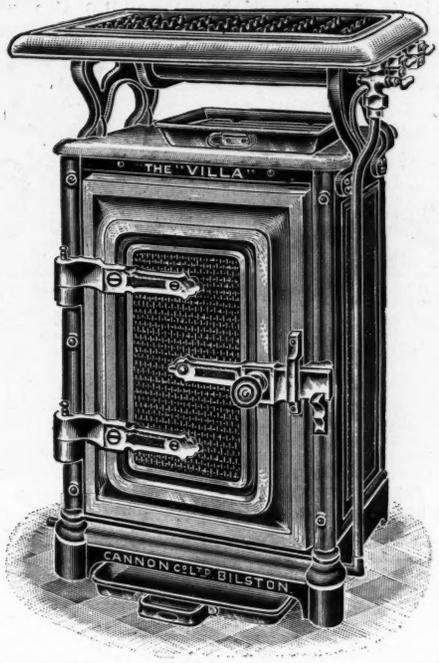

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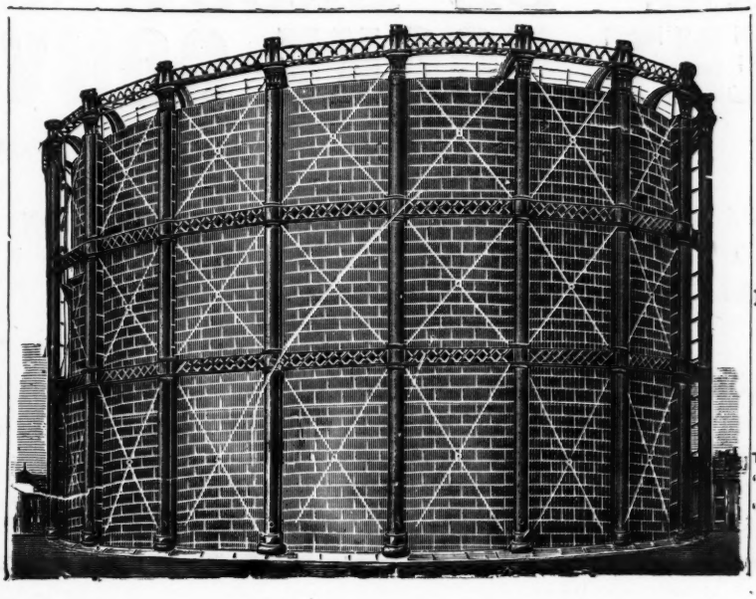

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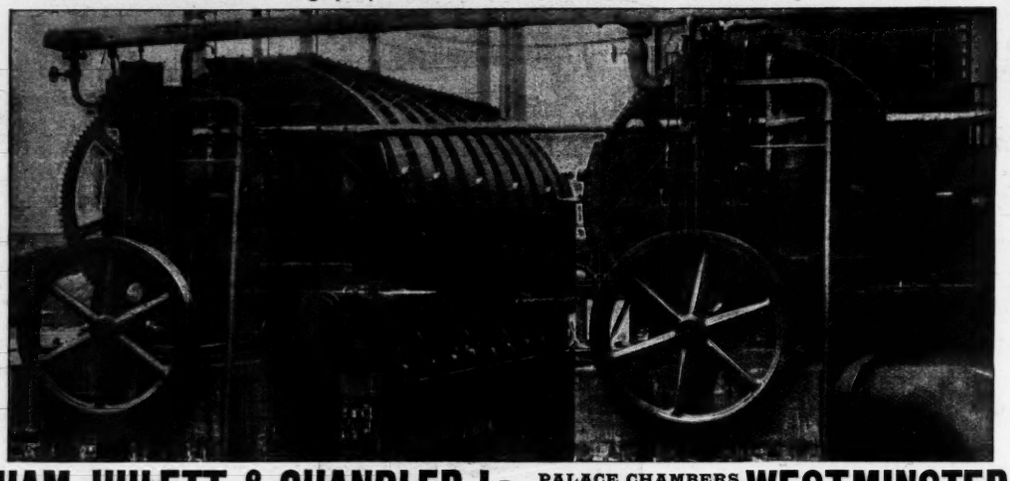

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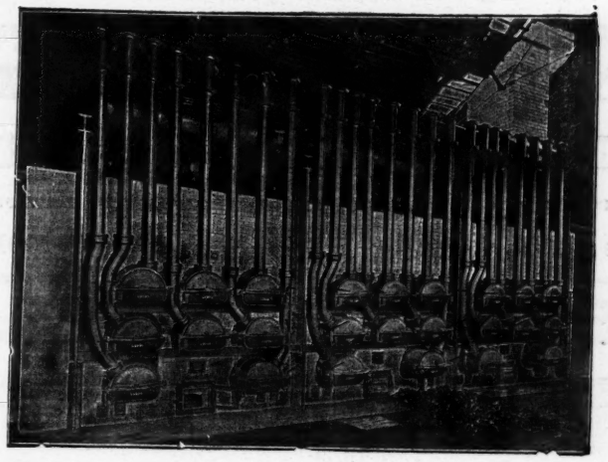

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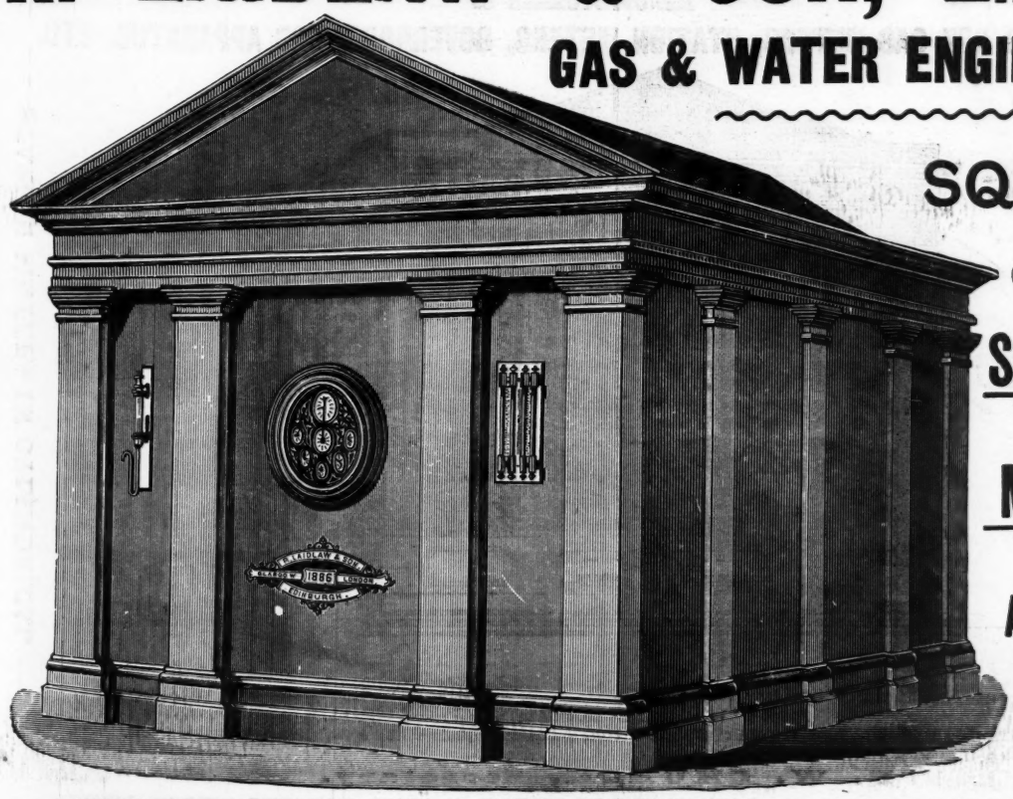

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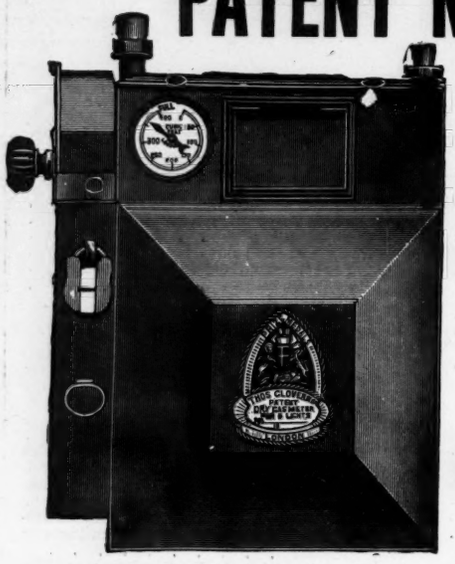

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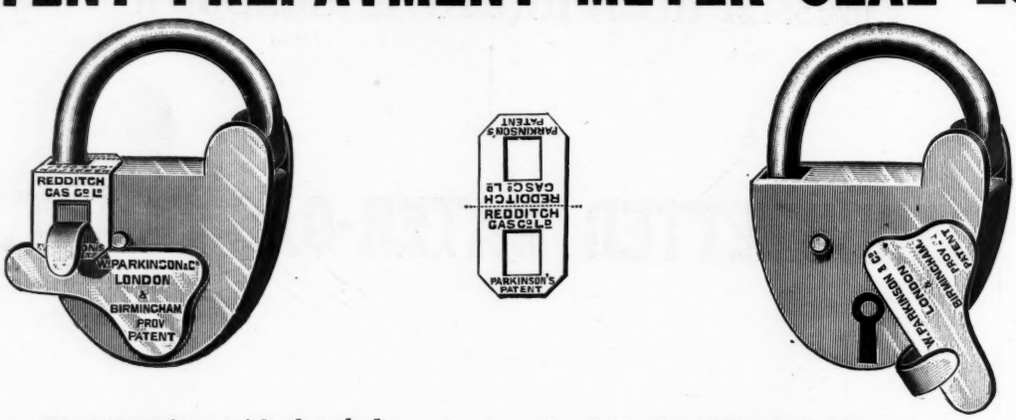

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EDITORIAL NOTES.

Mr. Price-Williams on Coal Statistics.

In "The Times" last Saturday, there appeared a letter headed "The Export of Coal," and signed by Mr. R. Price-Williams, who has claims to attention as having been employed by the Royal Commission on Coal, 1866-1871, to work out "most of the calculations in the estimates" contained in their report. The object of Mr. Price-Williams, in writing his letter, is stated to be to show, from the recently published census returns and the Board of Trade report on the "Production, Consumption, and Export of Coal," how the actual production of coal in the United Kingdom compares with the estimated quantities given in the report of 1871. He also seeks to call attention to the enormous increase in our coal exports, with the object of recording his opinion that "the time cannot be far distant, if it has not "already arrived, when some limit will have to be put upon "the coal exports of this country, and that the more slowly "increasing home consumption requirements must receive "first consideration." We do not wish to be unkind, but we must say that, if Mr. Price-Williams wrote his letter with the possibility of the appointment of another Royal Commission on Coal in his mind (he takes the opportunity of remarking that the radically inaccurate estimate made by the Argyll Commission of the probable course of the export trade was not of his calculating), his excursion into print has served a very different purpose from that intended—namely, that of calling attention to a curious blunder in his original estimates of the home consumption of coal, and, further, of showing how easy it is for an "expert" to come to grief in the handling of statistics.

Mr. Price-Williams quotes, from Table III. of the report of 1871, the estimates made by him of the population of Great Britain (not, it is necessary to note, the United Kingdom) in each of the years 1881, 1891, and 1901, and of the coal consumption within the United Kingdom during the three decades ending with those years; the latter figures being based upon the former. The population estimates were but slightly below the actual census returns; the increase in the thirty years being put down at 9,024,000, against an actual increase of 10,935,000. The consumption of coal in the United Kingdom per head of the population in Great Britain was estimated as 4·43, 4·58, and 4·63 tons respectively in the three decades in question. On those bases, Mr. Price-Williams calculated that the total home consumption in the thirty years ending with 1901 would be 4368 million tons. Taking the consumption for this year as being the same as in 1900, he shows an actual total for the period of 4054½ million tons, or 313½ millions less than his estimate. This lower figure he explains as being due to a smaller *per capita* consumption than that estimated. This is put before the public as being proof of "greater economy in the consumption of coal," notwithstanding the largely increased demands which the growth of industrial enterprise has made upon the coal resources of this country. Mr. Price-Williams remarks "that, instead "of the consumption having increased, as was anticipated, "to 4·63 tons per head, it is now, as the Board of Trade "returns show, only 4·08 tons—the effect of this being to "reduce the Commissioners' estimates up to the present time "by as much as 313½ million tons." Such are the "facts" put before the readers of "The Times." The actual facts are materially different.

As we have pointed out, the estimated consumption of 4·63 tons was per head of the population in Great Britain only. This is plainly shown in the table quoted by Mr. Price-Williams. The Board of Trade figure of 4·08 tons is per head of the whole population in the United Kingdom; and if Mr. Price-Williams had turned to page 171 of Part III. of the Home Office report on Mines and Quarries for 1899, he would have seen that a consumption of 4·08 tons per head of the total population is higher than the average in any preceding year—3·87 tons being the record figure prior to 1899, when it was 4·05 tons. The consumption of coal in the United Kingdom per head of the population in Great Britain (the basis of Mr. Price-Williams's estimates) was, in 1900, over 4·5 tons, as compared with 4·37 tons in 1891, 4·33 tons in 1881, and 3·97 tons in 1871. So that our *per capita* consumption of coal, so far from falling off and demonstrating "greater "economy" in its use, was higher last year than ever before! How, then, is the difference of 313½ million tons between the estimate made by Mr. Price Williams and the actual result to be accounted for? By the fact that Mr. Price-Williams's original calculations were incorrect! In order to compute the consumption of coal in a decade, he estimated first the population at the beginning and end of the period, and then the average consumption per head during the ten years. For example, he calculated that the population of Great Britain in 1891 would be 31,955 millions, and in 1901, 35,087 millions; and that during the ten years ending 1901 the *per capita* consumption of coal would average 4·6286 tons. To arrive at the total consumption for the ten years, he then makes the following calculation: 35,087,000 × 4·6286 tons × 10 = (say) 1,624,000,000 tons. This would have been correct if it were to be assumed that the population would increase by 3,132,000 between the 31st of December, 1891, and the 1st of January, 1892, and then remain stationary for ten years. On any other assumption, the calculation was considerably wide of the mark.

This extraordinary blunder—to which Mr. Price-Williams's latest mistake, of comparing two non-comparable figures and drawing an incorrect conclusion from the result of that comparison, directed our attention—accounts for over 200 out of the 313½ millions difference between the estimated and actual figures. The rest is due to the consumption per head of the population having increased at a slower rate than estimated. Mr. Price-Williams makes yet another slip in his letter. He says that the Argyll Commission found that in 1871 there "remained an available supply of 97,528 million tons of "workable coal, and a further estimated supply of 48,465 "million tons in undisclosed coalfields, underlying the Per-"mian and other . . . formations—altogether making "up a huge store of over 146,000 million tons of coal still "available as a future source of supply." The figures should be: Contents of known coalfields at depths not exceeding 4000 feet, 90,207 million tons (97,526 millions being the total at all depths); contents of undisclosed coalfields above 4000 feet, 56,273 millions (48,465 millions being the total coal, in known and undisclosed fields, at depths greater than 4000 feet, and declared by the Commission to be *not* available!); total, 146,480 million tons available. Mr. Price-Williams gets at a correct total by adding together two incorrect figures.

As we are anxious that a new Commission should supply us with reliable statistics and accurately calculated estimates, and that they should take seriously into consideration the question of greater economy in the consumption of coal, we have thought it well to show that Mr. Price-Williams's explanation of the discrepancy between his estimates and the actual results is no more accurate than were the original figures.

The Humanitarian Aspect of Retort-Stoking Machinery.

The introduction into the Southport Corporation Gas-Works of a very complete set of West's mechanical carbonizing appliances, worked by means of compressed air, has been properly signalized by the holding of a municipal function. The machines were graciously started by the Mayoress, and a highly satisfactory comment upon the whole affair has appeared in the well-informed local newspaper. The merits of the improvement of the Corporation Gas Estate are fittingly recognized on the triple counts of humanity, economy, and increased efficiency; but it appears to us, with an extensive and peculiar knowledge of these matters, that our Southport contemporary has gone slightly astray upon the first point. This subject is worth a little straightening out, because such matters as those which exercised the Southport writer are likely to weigh with members of local authorities elsewhere, and may possibly interfere with their exercise of a perfectly unbiassed judgment upon the merits of gas-retort stoking, by hand and machinery. This writer applauds mechanical stoking upon humanitarian grounds, opining that "no amount "of wages can recoup a man for loss of health; and it

"cannot be healthy for men to have to stand in the full flare "of a fierce fire, breathing an atmosphere of gas and smoke "and fumes." This is doubtless how it strikes an outsider; yet the fact of the matter is, as those acquainted with the vital statistics of the gas industry know, that the occupation of a stoker is by no means either a distressing or an unhealthy one for a suitable man. The point is that, without mechanical aids, really smart and efficient stoking is work for a select class of labourers, who are by no means easy to get, or to keep in satisfactory fettle when trained. A comparatively slight amount of help from machinery, such as Mr. John West originally devised, throws this employment open to a wider recruiting field for the necessary manual labour; while the latest and most complete equipment supersedes the hard labour altogether, and puts into the hands of a different class of men the work of directing the mechanical operations.

Here another consideration arises, which appears to touch the Southport Gas Committee somewhat sharply. The installation of mechanical stokers diplaces some of the old hands, which is regarded as a drawback, although it is recognized as the inevitable result of the introduction of labour-saving appliances. This is true. That a certain amount of hardship to individuals is the unavoidable accompaniment of the onward march of material civilization, is undeniable. There is no help for it. The effect is not confined to hand labourers, or to the particular class of such as find labour in gas making. The "hewers of wood and drawers of water" are the first to feel the influence of labour-saving machinery, because of the mechanical character of their employment, which readily lends itself to the operation of machine tools. But the same influence goes on in all grades of the active community, as appears in regard to the typewriter, the "process" engraving, and the linotype machine. If the lawyer's clerk described by Gilbert, who became First Lord of the Admiralty by reason of his careful copying of the office letters "in a big round hand" had remained in that rut, he would find to-day his occupation gone. The employers of gas workers, however, are usually better able than most to let down easily their superseded labour. They can begin, for instance, with the season hands, and give preferential employment outside to such stokers and firemen as are willing to take it. In the case of a local authority, as at Southport, the good offices of the other committees can be enlisted on behalf of the old retort-house hands. This is as it should be; for nobody wishes to see good men put out of an employment for no fault of their own. Only—and this is the capital consideration—no personal considerations of the kind can be allowed to clog the wheels of progress, from which all the world benefits in the end. Hand labour must yield to power machinery, which is the modern agency used by mankind for subduing the earth, according to the mandate laid upon the seed of Adam, from which there is no exception.

An Essay on Municipal Trading.

In an essay from which we reproduce extracts in another column, Mr. Walter S. Allen, of New Bedford, Massachusetts, has attempted to find a general answer to the question of whether public services should be municipalized. We have always maintained here that this is a question that can only be properly put and answered in respect to particular examples, on the merits of the special case. The contrary is held by the Progressive party in British municipal politics and their supporters in the newspaper press; but still, as a matter of fact, our parliamentary system requires every proposal of the kind to be justified on the point of expediency, without regard to the principle. Mr. Allen has plenty of experience of gas and electricity supply under both systems —by private companies and local authorities—in connection with the working of the Massachusetts Gas Commission, of which he was Secretary; and it is his deliberate judgment that this kind of public service can be done better and cheaper by private enterprise, if properly supervised in the public interest, than by local authorities themselves. He points out that those who advocate the municipalizing of public supplies usually employ two antagonistic and mutually destructive reasons for their predilection—one, that the service will be reduced in price to the lowest possible limit; and the other, that the local rates will benefit by the profits to be derived from the undertaking. The benefit, such as it is, of municipalization cannot be had in both ways. If the price of the service is cut down to the narrowest margin over cost, there will be no profit to relieve the rates. If there is a profit, it can only come from charging such high prices to users of the service as would make corresponding dividends for a company; and every penny by which the rates are subsidized means that somebody is surcharged to bear local burdens. "In other words, taxes instead of "being equal and proportional, or even based upon ability "to pay, are assessed according to the use made of the "modern improvements." Since those who use the services are a minority of the community, and are likewise in many instances those who can least afford to pay, a charge for service in excess of actual cost causes them to bear an unjust proportion of the expenses of the administration of the community. This contention appears to us to be irrefragable. Besides, as Mr. Allen pointedly says, it is simply a farce to pretend that any adventitious source of revenue ever relieved ratepayers of a modicum of their burden. Any local authority, like most private persons, can spend money in proportion to their income. More money to spend means for municipalities more money spent. The great spending committees of local authorities can with difficulty be kept within the limits of their estimates at any time; and how much less they feel this obligation when there are several corporation tills to dip into, there is ample experience to demonstrate. On other accounts, Mr. Allen's article makes interesting reading.

One More Utopia.

The promoters of a new organization for uniting, "on a "basis of common interest," all British manufacturing employers and their employees, with the objects of increasing efficiency and preventing strikes, have kindly supplied us with particulars of their scheme. The matter was briefly mentioned in last week's "Journal" (*ante*, p. 530), when credit for initiating the movement was given to Mr. John Lockie, of Newcastle-on-Tyne. It appears that there is actually in existence—with offices in Westminster, Newcastle-on-Tyne, Stonehouse, and Glasgow—a Society called the National Industrial Association, which claims to be a federation of Employers' Associations and Trade Unions, with a mission "to create and cement between employer and "employee a feeling of common interest." This professed fusion of Employers' Associations and Trade Unions strikes one at first sight as a fresh attempt to do what has so often been attempted in vain—to yoke in one team forces that have hitherto always pulled against one another. While there is no inherent impossibility in projects of this nature, it is plain that a real wedding of agencies that have existed merely to fight each other, can only be effected after those who direct and constitute them have agreed upon the way in which they should go in company. Otherwise the nominal union of such forces will only be such a sham as one sees exhibited in political and social life in unions between sections of people really at secret variance—bonds which snap at the first strain applied from either side.

Having regard both to their principles and the manner in which they respectively work, it is difficult to believe that Associations of Employers and Trade Unions will ever find a common ground of action. Individual employers and their workpeople can, and often do, find such a ground; and accordingly they work in harmony all their lives long. But that is only because the respective parties agree to mind every one his own business. It is scarcely necessary to point out that this is diametrically opposed to the first principle of Trade Unionism, which aims at the offensive and defensive alliance of all wage-earners against employers. A contented workman is necessarily a bad Trade Unionist; just as a good Trade Union is a body which is continually squeezing something out of employers. In order to do this, it is not necessary to indulge in striking—quite the contrary; for some of the most successful Trade Unions, from the point of view of their members, have never had a general strike. This is the case with the Boilermakers, whose retired Secretary, Mr. Robert Knight, is a patron of the new organization. A strike is a serious misfortune for a Trade Union, as society managers of Mr. Knight's calibre know full well. It is only the scatter-brained novices and outside satellites of the New Union brand, who shall be nameless for the present, that rush lightly into strikes, which generally turn out better for the employers than for the workpeople.

Indeed, a rash strike "for a principle" may be truly characterized as the best thing that can happen for employers, when once the attractions of Trade Unionism have alienated from them the loyalty of their workpeople. A sharp conflict on a plain issue, though it may endure for

months, is better than the canker of Trade Union disloyalty, eating ceaselessly into the vitals of the industry. Take the example of the Boilermakers' Society, one of whose district officials was the originator of all the trouble in the case of *Allen v. Flood*, which made so many horsehair wigs to shake. This is one of the most tyrannical and exacting, as it is one of the strongest, Trade Unions in existence. Employers of shipbuilding and repairing labour all round the coast are entirely at the mercy of this Society, whose rules as to working, and the delimitation of work, must be obeyed. The managers of the Union, trained by Mr. Knight, know better than to kill the goose that lays the golden eggs; but they are adept at securing as many of these as possible for their members. This is, of course, very much their business; but what the Society has done to increase output and keep down manufacturing expenses, is to us unknown.

We are asked to lend our countenance and support to the new organization, which Mr. Lockie is generously running by himself until it is able to stand alone. But before accepting the scheme as feasible, we want to know how it is going to be administered. It is very easy to understand that Mr. Lockie, who we believe is a shipowner, would dearly like to get upon equal terms with the masterful Boilermakers; but we do not believe the latter will let him do it by this or any other means. When two men ride upon a horse, one must ride behind; and when the name of Mr. Robert Knight, J.P., appears in such a connection, it is not doubtful as to where his seat will be. We say this in admiration of the man and respect for his character and abilities, which at the same time forbid our crediting any rumour of his willingness to cede a point just for the sake of "creating and cementing "a feeling of common interest between employer and em- "ployee." These be brave words; but they are nothing more. Mr. Knight and his henchmen may attend a public meeting with Mr. Lockie, and exchange "soft nothings" with that amiable gentleman, to the admiration of the reporters of the daily newspapers. But the first time a shipbuilding firm want a boiler tube set or fixed by methods or hands of which the former party disapprove, they will lose no time in letting it be known that with them sentiment is never permitted to interfere with business. If this impression is incorrect, we will reconsider our position; but failing assurance on the practical point, we shall continue to regard Mr. Lockie as the latest of the framers of a constitution for Utopia.

Mr. Justice Grantham on the Liberty of the Subject.

For some reasons, the amiably-expressed and temperate letter of Mr. Justice Grantham to a Welsh Socialist on the subject of Trade Union tyranny is as valuable as the recent House of Lords judgments. For while the arm of the law is long and strong, and has a way of prevailing over recalcitrants in a law-abiding country, it is at best a corrective and a means of restraint. It is not an inspiring motive. Many a man has refrained from committing what he knew to be an illegal act; but no man was ever yet impelled to do a thing merely because it was legal. The motives of human action lie outside the realm of law, and its springs are quite beyond the reach of jurisprudence. Hence, while it is of the first importance that all the citizens of a State should know what the law of the land is, in order to obey it, it is even better that their impulses should be in accord with the principles of fair-dealing and even-handed justice as between man and man, on which all sound laws are based. The only way to abolish the policeman is to render him superfluous.

Unhappily, those who profess Trade Unionism stand alone among Englishmen in claiming a right, by reason of their profession, to break the law at their own will and pleasure. The same way of thinking has been cultivated before now by various and sundry secret societies; and one such system—the "Mafia"—actually holds Southern Italy in bondage at the present hour. The ordinary cause of organizations of this kind is bad government and unequal laws. Where, as in Italy, the laws are made by raw *doctrinaires*, with little or no regard for the truths of life and human nature, it is no wonder that the people laugh at them. And where the resources of the land are eaten up by a legion of lazy functionaries like locusts for multitude, all government is likely to fall into contempt. In England, however, as Mr. Justice Grantham has been at pains to point out, there are no laws, and no governmental system, which honest men need combine to affront. Yet the moment the law is applied to prevent Trade Union tyranny, there is an outcry that the workmen's "right of combination" is being assailed. When a strike of workmen cannot be maintained without coercion and intimidation of those who have had enough of it, that is tyranny, and the law will stop it. What professed Trade Unionists apparently fail to see is that those who disagree with them are as free to act upon their opinions, so long as these are lawful, as they are themselves. Socialists, as his Lordship says, ought to hold this article as a fundamental point in their creed. There is no true Liberty without this principle in it.

Mr. Justice Grantham reminds his Socialist correspondent of the latter's professed devotion to the cause of freedom for the working man—freedom of conscience, freedom of thought, freedom of action. Why, then, his Lordship asks, should he be only free to think as other people think, and not as he thinks himself? What right has any one man to call another man a traitor to the others, because he elects to do what he has a perfect, natural, and legal right to do—to exercise his freedom of thought and action? The practical answer to this pertinent question is supplied by what has been going on at Bethesda, and at the Cork gas-works, where the harshest tyranny has been exercised in the name of Trade Unionism. Indeed, without this tyrannical rule, there would be no militant Trade Unionism at all. Trade Societies would soon become mere Friendly and Provident Societies, which would not at all suit the professionals' book. Such a change would sweep away seats in Parliament and on County and Town Councils, which are so many thrones for the wire-pullers of the Trade Unions, who would then be reduced, at once and for ever, to their natural insignificance.

Healthfulness of Electric and Gas Light for Interiors.

The old "wheeze" about the superior healthfulness and helpfulness to one's working powers of the electric light is still being worked in provincial newspapers. It has long served its turn in the upper circles of electrical propagandism, and it now comes in as useful padding for country newspapers in the dead season. An example of this kind of "advertisement" of electric light at the expense of gas has been forwarded to us, in which we read that the chief difficulty of house ventilation is removable by the simple expedient of banishing gas and replacing it by electric light. By way of freshening up this somewhat familiar recipe for long life and increased working capacity, the writer drags in a reference to the open-air cure for consumption. Now, while we are not in the least alarmed at such declarations as that "a clean and healthy home is impossible if gas or oil "is used for lighting"—because such exaggerations invariably defeat their own object—it is a cruel shame to delude ignorant people into the belief that a mere change of the means of lighting is sufficient warranty for their neglecting all the means of warding off disease and death which medical science has so painfully distinguished of late years. True, some workers in towns have been required to pass their labouring hours in close and unhealthy places where they have had to compete with the gas-light for the scanty oxygen needed for sustaining life and combustion. For these, the substitution of electric light for gas is an amelioration. But bad is the best in such conditions. Again, those devotees of pleasure who like to turn night into day, are almost applauded for their way of life, provided they disport themselves by electric light! What principle of morality is there here?

It has never been our way to deny to electric lighting the kind of popularity which attaches to champagne as a beverage, and will ever continue to go with it, irrespective of its cost. Within recent memory, the price of the best reputed brands of this choice product of France has risen 50 per cent.; but the demand for them has not diminished. Also, it were easy to argue that those who drink champagnes escape many of the perils that do environ the heedless absorbers of beer, who may unwittingly assimilate more arsenic than is altogether good for them. But the business world is not governed by such considerations. "Give me "the luxuries of life," exclaimed the wise philosopher, "and "I will dispense with its necessaries." Doubtless, this outburst awakens a responsive chord in all our hearts; but, unfortunately, life cannot be run upon such easy principles. Gas is a necessary of town life; and so is fresh air. With a sufficiency of the latter the former is harmless; and without it nothing is entitled to such a warranty. This is the conclusion of the whole matter, so far as the sanitary aspect of the question of inside lighting is concerned. The financial aspect is another matter, which the partisans of electricity prefer to minimize.

WATER AFFAIRS.

Sheffield and Its Water Undertaking.

When noticing, in the "Journal" for the 11th of June last, the report and accounts for the financial year ending the 25th of March, presented by the Water Committee of the Sheffield Corporation and their General Manager, Mr. W. Terrey, we took the opportunity of congratulating all concerned on the excellent results which had accrued from the management of the water undertaking since its acquisition by the Corporation about fourteen years ago. It is unnecessary now to go again into the financial and other details which gave rise to our remarks; it is sufficient for present purposes to mention that at the close of the year there was a total surplus of £76,179, after discharging all liabilities, including the payments into the sinking fund. It was pointed out at the time that this sum was not to be handed over for reducing the district rate, but would be held in reserve to meet charges arising in connection with the Little Don Valley works. When the Corporation were before Parliament in 1899, it was estimated that these works would be exhausted in 1910, and that the then sole remaining source of supply—the Ewden works—would not last longer than 1924, by which year it was supposed that water would be obtainable from the Derwent. It appears, however, that this will be available at a much earlier date; and therefore the Corporation have secured authority, by their Act of the session just closed, to postpone these works. The reasons for this step are fully set forth in a letter recently addressed to the members of the Water Committee by Alderman Gainsford, the Chairman, which has been published in a local paper, and will be found in another part of the "Journal." It is not often that the chief of a Corporation Water Department presents to its members so suggestive a communication on questions of policy as the one here referred to; and therefore we have willingly accorded space to it.

The main object Alderman Gainsford had in writing the letter was to show his colleagues that the changed conditions above alluded to will materially improve the prospects of the undertaking, so that the existing accumulated balance of £76,179 will increase till it becomes an extremely large sum. The calculated surplus is equal to about £9500 a year. Now, how can this money be most usefully employed? This is the question which Alderman Gainsford wishes his colleagues to answer; and he throws out some suggestions in order to elicit their views. He considers that £6000 or £7000 may safely be expended without any new or additional charge being imposed upon the city. He holds the opinion that neither the water consumers nor the ratepayers should be needlessly taxed; but he thinks that if the surplus were used either for reducing the water charges (which, owing to recent important concessions, have been brought into favourable comparison with those of other large towns) or for purposes for which the ordinary rates are applicable, an income would be frittered away without anyone really feeling better for it. He therefore suggests to the Committee that a substantial part of the surplus may well be employed, "for the "benefit of the city and people," upon such objects as would, in all probability, not be attained "if the rates had to "be called upon or increased to effect them."

We have always contended for the application of surplus profits to the reduction of price; but seeing that the charge for water per house in Sheffield is now only 7s. 2d. per annum, the consumers have little to complain about on this score. There is, however, another charge, to the lowering, or even the abolition, of which some of the money might, one would think, very usefully—and legitimately, from our point of view—be employed, and that is in connection with baths. The question of the supply of water to baths has been a troublesome one in Sheffield; and if any concession could be made in this direction, we have little doubt that general satisfaction would result. Of course, we do not know what Alderman Gainsford's views may be upon this matter; but, reading between the lines of one of the closing paragraphs of his letter, he seems to have contemplated the channel suggested as a possible one into which to divert the surplus funds, for he confesses that he would certainly devote a substantial part of them to making "concessions upon any "particular water charges" which would lead to distinct advantage, and especially conduce "to the health and personal "comfort of the people." The cheaper bath would assuredly do this; and, judging from opinions which have lately found their way into print, it would be much appreciated.

INTERNATIONAL ENGINEERING CONGRESS IN GLASGOW.

SECTION VIII.—GAS.

INAUGURAL ADDRESS OF THE PRESIDENT,

Mr. GEORGE LIVESEY, M.Inst.C.E.,

Delivered Tuesday, Sept. 3, 1901.

We may parody the proverb, "There is nothing like leather," and say, after its hundred years of life, that there is nothing like gas. Its convenience and adaptability to a multiplicity of uses, the beauty of its light, and its cheapness, account for its sustained popularity, and render it indispensable to modern life. It has played a great part in the industrial progress and the civilization of the wonderful Nineteenth Century; and it is a safe prophecy to declare that it has at least as great a part to play in the Twentieth.

A hundred years ago, Murdoch introduced coal gas as an illuminant in the factory of Boulton and Watt at Birmingham; and a few years later the first gas company was established to light London. From that time, the growth of the industry has been both continuous and rapid, and never more so than in the last decade. The price has been reduced to about one-fifth of that charged seventy or eighty years ago; and it would not be very wide of the mark to say that gas is used in almost every house and workshop in our cities and towns.

The great reductions in price need more than a passing notice; for in this particular the reduction in the charge for gas stands out in striking contrast to the charges for the two sister public services that with gas have been so largely developed by joint-stock enterprise—viz., water and railways.

From the early days of gas, there has been, and is still, a general desire to reduce the price. Possibly one reason may be found in the fact that, in almost every place of importance, rival gas companies competed with each other for custom during the first half of the century. There is, however, another reason. Here and there throughout the country were men (and happily the race is not extinct) in charge of gas-works not content to leave well alone, or to stand still, but always striving to improve; thus setting the pace which had to be followed more or less closely—in fact, very closely in the competing days. Competition, however, killed itself. The last effort in that direction was the formation of the Great Central Gas Company to supply the City of London, and the Surrey Consumers' Company for South London, whereby the price of gas was temporarily reduced from 6s. to 4s. per 1000 cubic feet in 1850. So severe was the competition, that the old and new Companies soon came to the conclusion that it was suicidal, and allotted a separate district to each Company—thus creating a monopoly in the supply of gas in London.

The same thing was done in the large towns, where the competing companies united; hence so many "United Gas Companies." In the year 1860, Parliament, being convinced that competition in gas had become impracticable, and the existence of the mains of several companies in the same streets a grave public inconvenience, sanctioned the districting in the whole Metropolis; and henceforth competition between gas companies ceased everywhere.

Then came a period of great prosperity—if the payment of full dividends and the making up of back-dividends alone deserves the name. The existence of pioneer men, of the class already referred to, saved the industry from disaster. Gas had no competitor; for candles and oil at from 5s. to 7s. per gallon could not be so regarded. There was, therefore, no inducement to improve, but rather to sit still, take the new business that came of itself, and pocket the profit. Gas companies' capitals increased, as well they might when new issues were allotted to the shareholders at par, on which full dividends were practically guaranteed. To protect the consumers, Parliament was led, in 1860, to introduce the system of testing the illuminating power and purity of the gas—legislation that has never done an atom of good, but an infinity of harm, to the public, and it has culminated in the elaborate and costly and worrying system in vogue in the Metropolis.

From the early days of gas lighting up to the end of the century, the public, and gas makers also, have believed that

gas of as high an illuminating power as possible was the *desideratum*. Companies were established in London for the supply of cannel gas in competition with others making gas from Newcastle coal. One of them, the South Metropolitan —started with this object in 1833—was only saved from bankruptcy by changing to common gas in 1838. Everyone, in fact, was on the wrong tack. Instead of trying to develop the lighting power of the gas, which I think Mr. Sugg was one of the first to attempt, the idea was to make it as rich as possible in hydrocarbons. Then, perhaps to prevent the inconvenience and dirt of smoky flames, burners were used that certainly accomplished that object, but they gave very little light—in some cases about one candle per cubic foot of gas. Sugg's "London" argand, Bray's flat-flame burners, Siemens', the Wenham, and others of the regenerative class, were all important steps in increasing the duty per cubic foot, until Welsbach's wonderful invention capped, and seems destined to supersede, them all by the introduction of an entirely novel and really scientific method of obtaining light from gas. The consumers now have it in their power to get out of 5 cubic feet of gas per hour anything from 5 to 150 candles from ordinary coal gas, whether it be nominally 10, 15, or 20 so-called candle power.

What a useless absurdity does this make of all the illuminating power tests! Photometers that for forty years have given so much trouble, caused so much anxiety to, and wasted so much of the time of, gas managers, and have also caused so much loss to the consumers, are now proved to be, what they always have been, most useless instruments, and must sooner or later have their woodwork converted into firewood, and their metal consigned to the old brass-tub—to trouble gas managers no more.

Reverting to the historical summary, the period of fictitious prosperity, with nothing in the shape of competition, lasted about ten years—to the early seventies. Then appeared the first serious competitor in the shape of cheap mineral oil; and a few years later the electric light entered the field. Gas lighting was thus attacked on both flanks—in its rich and poor, upper and lower consumers—with serious danger of attacks on the centre. Gas had no longer a monopoly as a light-giving agent; but Parliament, at the instigation of local authorities, instead of relaxing restrictions, increased them. When the supposed necessity for protecting the consumers had ceased—for they could be independent of gas—more stringent regulations were imposed. In all probability this was a result of the ten years' absolute monopoly, when regulations of some kind were necessary. It was not perceived that, with entirely altered conditions—the change from monopoly to active competition—relaxation and not increased restriction was what justice to the gas industry demanded and the service of the public required.

The old legislation, dating from 1847, governing the price of gas and the rate of dividend, was adapted to competing gas companies. When that competition ceased, which was the real protection of the public in the matter of price, the legislative enactments had no effect on the price, while they gave ample protection to the shareholders' dividends. In fact, it separated rather than drew together consumers and shareholders. This was remedied by the sliding-scale introduced in gas legislation in 1875; its sole merit being that it identifies the interests of consumers and shareholders, and in effect makes them partners. Whether or not it is the best means for accomplishing that object may be questioned; but our goal is complete identification of the interests of producer and consumer. Until a better plan for its attainment is devised, the sliding-scale holds the field; and I venture to say it should have been made compulsory, just as are the auction clauses, of which it forms the complement. At any rate, the principle is right, and it is only a question of improving the method of its application. The sliding-scale, as embodied in gas legislation, supposing it to be the best-known means of accomplishing the object in view, at present stops half-way. There is another to be included in the partnership—another interest to be identified. The producer is not one but two—the man who finds the capital, and the man who does the work. I have tried to make a triple partnership—Capitalist, Employee, and Customer; and the results of twelve years' working have greatly exceeded expectations. If ten years ago anyone had said that the employees in 1901 would have £140,000 invested in the stock of, or on deposit at interest with, the South Metropolitan Company, I should have pitied his ignorance of working men; for of such a result I never dreamed. The result of seven years' working of the same system in the Crystal Palace District Gas Company is equally satisfactory. In a sense, better even than the money earned and saved by the men is the feeling of mutual confidence and goodwill that exists between all ranks in both Companies. The workmen of another large Company have, with practical unanimity, just accepted the system, as the men at Chester did a few months ago; and profit-sharing without shareholding was, about two years ago, adopted at the Corporation gas-works at Stafford.

Here companies have the advantage over corporations, and to the inestimable service gas companies have rendered to the public during the last century may be added (if they will) the further great service to their country of showing how the interests of Capital and Labour, of Employer and Employed, may be reconciled. The system has had much thought spent upon it, and no doubt may be improved; but if from a first attempt such results have been obtained, what may not be expected if other minds will bring effort and intelligence to its working and improvement. The object is well worth all the labour spent upon it; and it brings an ample reward.

Since gas ceased to hold the monopoly of light, nearly thirty years ago, the advance and improvement in its manufacture and supply, and its increased uses, have been greater than ever, more especially during the last decade. The South Metropolitan Company used 637,583 tons of coal in 1890, and 1,130,833 tons in 1900—an increase of 493,250 tons in ten years, or 77 per cent.; that is, the actual new business gained in the last ten years is not very far short of the total acquired in all the previous 74 since the first South London Company was formed. Gas not only more than holds its own as an illuminant, but since its monopoly as an artificial light ceased, it has come very largely into use for cooking —although a few gas cooking-stoves were in use over fifty years ago—heating, power, and manufacturing purposes. By means of the "slot" meter, it has taken almost universal possession of workmen's dwellings; and by the Welsbach mantle it has distanced all competitors in the beauty and cheapness of its light. We hear of decaying industries; but with such vigorous growth, instead of decay, there is abundant life, that gives promise of more uses and greater usefulness than ever.

This is an Engineering Congress; but the subject has not been mentioned in this address. In attempting to speak for this great and indispensable industry, surely the fact that it has been created, built up, and sustained by engineers is sufficient. Its future rests with engineers more even than its past has done; and those who devote themselves to it will find ample scope for their talents, however varied they may be. The first and greatest need of the gas industry is that the supply of men should be maintained. Men in the best sense of the word are needed, in all ranks, to fill up vacancies and to occupy new ground. Board and technical schools do not produce the article; I sometimes think they rather tend to check the development of manhood. Technical training will not save the national industry; but men who love work more than play, and who will put heart and brain into their work, are the necessity of the age. Technical training is very good and necessary, but you must first "catch your hare," or rather find your engineer before you train him; and then take care that you do not convert him into a man of mere routine—a simple copyist. The making of plans and sections, and the calculation of strains, are not his highest work. It is not by the repetition of old designs and ideas that progress is made. We need engineers who will look ahead, anticipate as far as possible public requirements, and then bring all their skill to meet them. One of the greatest of public necessaries is smokeless towns and cities. The gas engineer is the man to provide smokeless fuel, cheap, abundant, and suitable for all purposes.

As is the engineer, so should be his helpers and subordinates, if he is to do the best work. One of his most important qualifications is the ability to select and train his assistants of all grades, down to the workman, who is very much what his employer makes him. This duty of employers, who are the natural and proper leaders of their workmen, and should be their trusted friends, has been too much neglected; and both classes suffer from the neglect.

The gas industry wants freedom to do its best for both the public and itself. Legislative restrictions should be removed, and the suppliers of gas left free to do their best to meet the needs of their customers. The sliding-scale and the auction clauses automatically ensure the careful raising of capital at the lowest possible rate, and its judicious spending. They also make it the interest of the company to sell at the lowest

possible price. The consumers can now take care of themselves; and the gas company, to be successful, must supply what its customers require at a price, and of a quality, that will satisfy them. I therefore ask that all needless restrictions—and most of them are needless, as is proved by the fact that in the case of corporation gas supply they are very much a dead-letter—be removed, and that the gas industry generally be freed to meet the competition that confronts it. The great public need is cheap gas of good heating power, the nominal illuminating power not being a consideration. We are much behind places on the Continent in this important advance; and we shall do well to follow their example. The great and immediate work of gas engineers is to meet this public want. In six years at most, the Welsbach patent of 1893 expires; and it may be proved to be invalid any day—witness the important statement in last week's "JOURNAL OF GAS LIGHTING." With mantles at 2½d. each—the price at which they are now being obtained from Germany—only heating gas will be required; for incandescent lighting must then become universal.

Therefore let the engineer "take time by the forelock;" forecast the future; and devise a satisfactory method of producing the gas that the near future (and it may be very near) requires. It is not so easy to bring down the illuminating power as would naturally be supposed; manufacturing plant has to be altered, and new methods invented. Truly the engineer has a work worthy of all his efforts; the men surely will not be wanting.

A last word referring to the relations of public authorities with gas companies. Why are they so unsatisfactory? What other public service can show such a record of good work done for the public? What other article of utility has come down from 10s. to 2s.—the same article, and not something different? The public does not know the extent and value of the service. Glasgow has great and well-deserved respect and esteem for William Foulis; but it does not know the extent of the benefit he has conferred on its citizens. In annual money saving alone, it is safe to say that the result of his personal labours, over that which would have been attained by an ordinary man, is gas at quite 3d. per 1000 cubic feet lower. Now 1d. per 1000 cubic feet amounts, in round figures, to £20,000 a year; therefore, the gas consumers of Glasgow are indebted to their Gas Engineer for a saving of £60,000 per annum. When such possibilities rest with the gas engineer, it is surely but necessary to mention the fact to ensure to the capable engineer the consideration and the treatment he deserves.

This is an International Congress, and we are favoured with some very valuable papers both from America and the Continent. It is my misfortune that I know so little personally of gas manufacture abroad; but I do know that, in enterprise, invention, and progress generally, they are certainly not behind us, and in many points we have much to learn from them. We hail them as brethren in the useful work of gas manufacture and supply.

Petroleum Production.—The production of petroleum in various countries last year amounted to 150,000,000 barrels, in round figures. The output of Russia was 77,230,560 barrels; that of the United States, 63,362,700 barrels; that of Galicia, 2,346,500 barrels; that of Roumania, 2,000,000 barrels; that of Sumatra, 1,520,000 barrels; that of Japan, 1,116,700 barrels; and that of Canada, 625,650 barrels.

Monier Cylinders for Bridge Foundations.—Amongst the selected papers published in a recent issue of the Proceedings of the Institution of Civil Engineers is one by Mr. E. M. De Burgh, M.Inst.C.E., describing the use of cylinders of armoured concrete for bridge foundations, which constitutes, it is believed, a new departure in the development of the Monier system. Cast-iron cylinders, he states, have been very largely used in New South Wales for bridge foundations in salt water, but a great advance in the price of cast iron led him to consider the possibility of replacing this material by armoured concrete pipes. This was successfully accomplished at a great saving in cost—the Monier cylinders costing but 24s. per foot, in place of £3, the cost of cast-iron ones. The cylinders used were 4 feet in diameter out side, and were 2⅜ inches thick. They were constructed in lengths of 3 ft. 7 in., and were made up of one layer of steel wire netting of 1½ inch mesh and No. 16 gauge wire, and two spirals of No. 8 gauge steel wire wound completely round the cylinder at a pitch an inch. A cast-iron cutting edge was provided. With the view of facilitating the connections of the different lengths longitudinally, steel bars 1¾ inches by ¼ inch were embedded in the concrete between the spirals; sockets being left at each end, so that the bars in successive lengths could be coupled up by a small fishplate and steel wedges. The cylinders were sunk through gravel, sand, and clay to a depth of 36 feet below water-level.

ESSAYS AND REVIEWS.

THE TRADE UNION BLIGHT.

EVERY effort made to bring home to the minds of the general public—that terribly ignorant entity, which places such faith in the instruction conveyed to it by the daily journalist (often only one degree less ignorant)—the fact that Trade Unionism as practised in this country is diametrically opposed to the commercial progress of the nation and to the real progress of the working classes, is heartily welcome. We have preached that truth in season and out of season; and the more thoughtful and informed section of the public is becoming slowly, but we hope surely, alive to the facts of the case. But the general run of people still have it in their minds, what the "Progressive" type of newspaper is always proclaiming, that Trade Unions are defensive organizations engaged solely in the work of protecting "Labour" from the tyrannies and injustices of its arch-enemy "Capital." We accordingly gladly call attention to an article in the August number of the "North American Review," in which Mr. Benjamin Taylor sets out some of the facts as to "How Trade Unionism Affects British Industries."

Mr. Taylor speaks with no uncertain voice on the subject. He says: "I have been branded for denouncing Trade Unionism as a blight on our industrial system, as if I were something infinitely worse even than a person who could speak disrespectfully of the equator. Without admitting that Trade Unionism has done all that is claimed for it in the raising of wages and the bettering of the condition of the working classes—changes which must have occurred in the natural order of things, as society developed—I do affirm that it has done much social and industrial harm. A workman on joining one of these organizations ceases to be a free agent; he becomes the slave of his society and the tool of its officials. Does that make for manliness, and individual energy, and social well-being? . . . . In theory, the Trade Union is an organisation for the protection of labour against the tyranny and oppression of capital. In practice, the British Trade Union is an organization for the restraint of labour and the manacling of capital. . . . . Let the theory be as beautiful as you please; the practice is abominable." And he gives plenty of concrete instances of the abominable practices that, in the eyes of practical men, completely obscure the beautiful theories.

With those drawn from the history of the struggle for supremacy between the masters and the Unions in the engineering trades—as to which Mr. Taylor truly says "the whole black record is one to make every honest working-man sick with shame"—our readers are fairly familiar; but we must allow ourselves one quotation, taken from the report authenticated by the Employers' Federation:

> A reports that, when making ammunition-boxes for six-pounder cartridges some years ago, it was found that, in finishing up the hinges, any member of the Society employed on the job used always to do exactly eight in a day. The foreman in charge knew that this was not a day's work, and he changed the men; but in every case, notwithstanding that considerable changes were made, the Union men made exactly eight per day. A young Swiss (non-Unionist), who did not speak English, was then put on the job; and the first day he did *fifty!* The same firm report that, in filing up the outside handles of machine guns, it was found that any member of the Society working on the job generally did one a day. The firm knew this was not a day's work, but were unable to get a Society man to do more. The work was then given to a gun-filer not belonging to any Society, and he did *twelve* a day.

Well may the writer speak of "the deadly effect of Trade Unionism on the energy, morality, and capability of the workers." But for the knowledge that these and scores of other instances were established as facts by unquestionable evidence, one would feel disposed to doubt whether any Britisher of the standing of a respectable mechanic could be guilty of such dishonest conduct. For it means that every man practising such methods is robbing his employer, inasmuch as he is taking a full day's pay for (in the case of the machine-gun handles) less than an hour's work, and at the same time acting a lie in pretending that what he has done is a fair day's work. And all this dishonesty and deceit is practised because the Trade Union officials, and the politicians who live by their favour, continue to preach, and the men believe in, the stupid old fallacious doctrine that there is only so much work to go round, and so the less each man does the fewer the unemployed men there will be. Yet the result is often the exact opposite; for by forcing up the cost of production, the Unions have driven trade out of the country altogether.

Of this, Mr. Taylor gives a particularly striking instance. "The story of the flint-glass trade is a very instructive one. This used to be a very extensive and lucrative business in Great Britain; affording highly-paid employment to many thousands of workers. These workers had, of course, their Trade Union. The Union waxed fat, and kicked on the question of apprentices; and it succeeded in enforcing a strict limitation to the number of boys to be allowed to enter the trade in any one year or in any one factory. Having secured this, they put the screw on wages until they raised the pay of an ordinary journeyman to between £3 10s. and £4 a week. The monopoly of labour was complete—but not the monopoly of supply. The Germans stepped in and

took the trade bodily from under the nose of the Flint-Glass Makers' Union, which now does not, in the whole United Kingdom, contain as many members as there are workers in many a single factory in Germany. The industry has gone (save two or three high-class concerns making costly tableware for the wealthy), and with it the workers, who either emigrated to America, or sought employment in other over-crowded avenues. Much the same thing happened in the bottle-making industry. Apprentices and production were kept down, and wages forced up, until bottles became so dear that Belgium sailed in and 'scooped the market.' German table glass and Belgian bottles now tell the tale, in every British household, of what aggressive and tyrannical Trade Unionism can do for the industries of the country."

We are glad to see that Mr. Taylor emphasizes the fact that "the initial cause of the ruin of these industries was the limitation placed on apprenticeship;" for, as we have so often urged, "that is one of the most dangerous and lamentable features of Trade Unionist policy as still pursued." The Trade Union, we are often told, has "improved" the position of the working classes. In the case of the glass and bottle trades, it will be seen, its zeal on behalf of the labourer has so far improved his position as to improve it away altogether! And so with the London shipbuilding industry and the Nottingham lace-making trade. Yet the Trade Unions and their interested advocates pursue, unheeding, the disastrous tenour of their way. "Those who support the demand of Trade Unions for a minimum wage, and those politicians who contend for what is known as the 'Fair Wage' clause in public contracts, do not stop to consider the demoralizing character of those demands. Instead of honest toil, it means the 'Trade Union stroke'; and the 'Trade Union stroke' means compelling the most highly-gifted artizan to slow down to the pace of the most slovenly. It means yielding the smallest possible amount of real labour for the largest possible day's wage. And the insertion of the so-called 'Fair Wage' clause in state and municipal contracts is designed to make the Trade Union masters of the situation wherever public work is concerned."

This has been said before—we have often said it—but it needs saying again and again, and as bluntly and publicly as possible. The worst of it is, the greatest danger in the situation is, that our leaders of public opinion are afraid to say it. The political power of the Trade Unions is too powerful, apparently, for any politician to think it worth his while to speak plainly upon this matter. Here is an opportunity for Lord Rosebery—the Public Orator, as someone has called him. He has told us that party politics are to know him no more—for the present at any rate. He is ploughing a lonely furrow, with the avowed desire of ultimately benefiting the Empire of which he is so conspicuous an ornament—if, at present, nothing more. Now he could do the Empire no greater service than that of pointing to the cancer that is threatening the vitals of its trade. "Britain's greatest national danger," says Mr. Taylor, "lies in the destruction of free-trade in labour. It threatens not only British industries, but also British defences, as has been seen in delays in the construction of warships caused by Trade Union obstructions."

Now Lord Rosebery has on more than one occasion called attention, most earnestly and emphatically, to the certainty that our manufacturers will have to encounter in the future more strenuous and aggressive competition than they have hitherto had to meet. He has pointed to the need for improved methods of educating and training the rising generations who must bear the brunt of the fight, and to the necessity for the more thoroughly businesslike management of our industrial concerns. That has been a service to the country; but he will do a far greater service if he will speak plainly to those of the working classes who are under the spell of Trade Unionism—tell them what fools they are to their own interests in hampering the trade of the nation with their contemptible "demarcation" disputes, and their dishonest "Trade Union stroke," and how economically unsound is their idea that restricting production is good for trade. "It is not so much technical education that is required," Mr. Taylor declares, "as the the awakening of the working man to the fact that he becomes his own worst enemy when he joins a Trade Union."

To undertake that task is to run the certain risk of incurring great, if temporary, unpopularity with a numerically powerful section of the electorate. Will Lord Rosebery undertake it, with that knowledge? Or is there any party politician willing to run the risk for the sake of his country's welfare, and the benefit of the working classes? Mr. Chamberlain in his long connection with Birmingham, and Mr. Asquith at the Home Office, must have seen and heard the true inwardness of Trade Unionism. Would that they might but speak that which they do know, and speak it very plainly. There would be shrieks in the "Progressive" organs, and fury on the part of the Trade Union officials and labour politicians, while the good people who know nothing about it but think that if the men sing hymns when on strike their cause must be a perfectly just one—we well remember the play that was made with such incidents during the Coal Strike of 1893, and the Bethesda Choir is a recent example—would receive a painful shock; but it would do a world of good.

Many of those well-meaning people (who so often are, unintentionally, very ill-doing) look upon the Trade Union of to-day as an institution sanctioned by antiquity; but, as is pointed out, the modern union is not the true descendant of the old Trade Guild, but differs from it in essential matters. "The old Trade Guilds were combinations of masters and workmen for the promotion and protection of a trade or craft as a whole. The modern Trade Union is a combination for the sole purpose of furthering the supposed interests of the workmen, without regard to the interests of the trade as a whole. In the old system, there was the element of solidarity in the relations between capital and labour. In the new system, there is the element of antagonism. In the old system, the craftsman prospered according to his skill and industry. In the new system, skill and industry are reduced to one common denominator, called the Trade Union rate of wage." That is to say, the profit-sharing scheme is the true successor of the Trade Guild in the industrial world's evolution—retaining its advantages, and discarding its limitations and false economics. The Trade Union, if regarded as in any way the offspring of the Trade Guild, is a debased type, retaining the vices and discarding the virtues of its ancestor. The sooner the public realize how dangerous those vices are to the national weal the better.

THE DEPRECIATION OF THE CANDLE-UNIT.*

The text-book on photometry by Professor Stine which has recently been published is in many respects an excellent work; but it has certain very grave defects, of which the chief from the English gas engineer's standpoint is an utterly unwarrantable disparagement of the candle-power unit. Because the candle itself—whether the English standard sperm, the German paraffin, or other variety—has been found to be a very unsatisfactory working standard of light, Professor Stine would reject the candle as the unit of illuminating power, notwithstanding that it has been in use almost from time immemorial, is practically the only standard recognized in legislative enactments, and has had its average value exactly determined and reproduced in a perfectly practicable and reliable reference standard. He would substitute for the candle the Hefner unit, as the following quotation from his work shows: "The numerous candle-power ratings of the standard candle in the literature of photometry, are only mean values obtained between wide extremes, or merely figures, and represent no physical quantity. The term 'candle power,' then, being meaningless as a quantitative expression, and the amyl-acetate lamp being fairly precise as a standard light, photometricians might follow the example, notably of German practicians, and express illuminating power in terms of Hefner units (*Hefner Licht* is the current term in Germany)."

Now, without entering on a prolonged discussion of the merits and demerits of the term "candle-power," we may point out that it is not more meaningless, and is considerably more euphonious than "Hefner-unit-power," which is Professor Stine's alternative until such time as Hefner may be forgotten and the proposed unit known simply as "light-unit," when presumably we shall be required to speak of gas of such and such "light-unit-power." But the expression "candle-power" has the advantage of affording a clue to its meaning even to non-technical persons, all of whom have some conception of the intensity of the light of a well-made candle. And actually as there is comparatively little difference between the average value of the light of such candles, whether made of spermaceti, as in the case of the English standard candle, or of paraffin, as in the case of the German standard candle, popular conception of the meaning of the term "candle-power" could not be much at fault. "Hefner-unit-power" would be meaningless to the majority of persons; and we submit that it is no more precise than is "candle-power." The average value of the light afforded by the English standard candle is represented by the Harcourt one-candle pentane air-gas flame with as great a degree of precision as is obtainable in photometry. Such has been the unanimous verdict of every commission or scientific body which has investigated it since it was first submitted to the Board of Trade by its inventor in 1879.

But Professor Stine clearly has only an imperfect hearsay knowledge of this one-candle air-gas standard flame; for his description of it teems with errors, and, moreover, he seems to be under the impression that recent photometric researches have not confirmed the earlier conclusion as to its exactness. For instance, he refers to the preference expressed by the Committee of the British Association in 1888 for the pentane air-gas flame, in the following terms, in the course of some eulogistic remarks on the Hefner standard: This Committee, "while calling attention to the constancy of this [the Hefner] standard, both in reproduction and operation, regarded it as distinctly inferior in both these respects to the Harcourt pentane standard. They especially criticized the red tinge of the Hefner light. Disregarding the influence of national bias in each case, the conclusion of the German Commission is entitled to the greater weight—being not only more recently formed, and hence with improved lamps, but being based on more thorough and accurate investigation." And on another page, Professor Stine says: "The German Commission states that the Hefner lamp deserves to be given the preference for excellence over the pentane lamp." Now be it observed that the German Commission issued their report in 1895, and preferred the Hefner lamp to the "pentane lamp"—not to the pentane air-

* "Photometrical Measurements and Manual for the General Practice of Photometry, with especial reference to the Photometry of Arc and Incandescent Lamps." By Wilbur M. Stine, Ph.D., Williamson Professor of Engineering in Swarthmore College. New York: The Macmillan Company; London: Macmillan and Co., Limited, 1900.

gas flame. But the latter is the standard which has been consistently found by all (including the British Association Committee) who have exhaustively investigated it, to be the most reliable standard of light, and to represent with precision the average illuminating value of the standard candle.

The Committee which reported to the Board of Trade in 1895 came to this conclusion; and therefore Professor Stine is wrong in saying that greater weight is to be attached to the German Commission's opinion because it is "more recently" formed. As before remarked, the Professor evidently has no practical knowledge of the Harcourt one-candle air-gas flame; and his inaccurate description of it, and disparaging remarks, indicate that he has not taken the trouble to investigate the literature dealing with it. For instance, he speaks of the proper proportion of air for the complete combustion of the pentane vapour having been found to be 20 volumes of air to 7 volumes of pentane vapour at 60°. This is sheer nonsense. The proportions named are the relative proportions of air and pentane vapour in the air-gas, which of course requires an independent further supply of air for its complete combustion. Professor Stine moreover is confused by the dual control of the standard flame, which Mr. Harcourt provided in his endeavour to avoid any chance of its misuse. In the first place, the standard air-gas must be properly prepared—*i.e.*, from a given volume of liquid pentane at a definite temperature, and a given volume of air under normal conditions. After the pentane has vaporized and diffused into the measured volume of air, the volume of gas thus formed must fall within certain narrow limits, which are specified. Thus the composition of the air-gas is strictly controlled. But, further, it must give a flame of the standard height of 63·5 mm. under normal barometric conditions, when it is burning at the rate of 0·48 to 0·52 cubic foot per hour. If both the proper relative proportions of gaseous pentane and air are obtained in the preparation of the air gas, and the rate of consumption falls within the above limits, then the 63·5 mm. flame burning under normal barometric pressure accurately represents the average light of one standard candle. If the barometric pressure is other than normal, the height of the flame is altered according to a simple rule, which has been shown to be applicable over a wide range of fluctuation of pressure by the results of researches conducted both with artificially varied atmospheric pressures and on mountain summits such as Ben Nevis.

Now Professor Stine nowhere gives a correct description of the one-candle air-gas flame standard; but he gives an account of it in which there is much confusion with other of the numerous pentane standards that have been brought out by its inventor from time to time. Moreover, he attributes to it defects which some of these have, but which it certainly has not. He appears to think that Liebenthal's critical researches—as reported in the "JOURNAL," Vol. LXVII., p. 124—on the Harcourt (Woodhouse and Rawson) one-candle pentane lamp, which tended to show that the light of the lamp was affected to a greater degree by changes in atmospheric pressure and humidity than was the light of the Hefner lamp, apply with equal force to the one-candle air-gas flame; whereas, of course, they do not. The height of the air-gas flame is set according to the prevailing barometric pressure, so that the light afforded by it is always the same. It is, therefore, eminently suitable for a reference standard at all times; and in this respect it is far superior to either the one-candle pentane lamp or the Hefner lamp. Furthermore, it has the great advantage of being produced without the intervention of a wick. Lastly, the colour of the air-gas flame makes it far more suitable for general photometric work than the Hefner lamp, which gives a flame with a great preponderance of red rays.

In the light of these facts, it is hard to see why Professor Stine should impute the influence of national bias to the British Association Committee or to the other bodies of English scientific men who have pronounced judgment in favour of the Harcourt one-candle pentane air-gas flame. But any impartial body of men at the present time would be still less disposed than formerly to regard the Hefner lamp as the best available standard of light, seeing that the sole tangible objections to the one-candle pentane air-gas flame as a working standard—lack of portability, necessity of long antecendental preparation for use, and low intensity—have been overcome by the production of a portable lamp giving a light of ten times the intensity at fifteen minutes' notice. We refer to the Harcourt ten-candle pentane lamp, which is now in use in the official testing-places of the Metropolis.

What objections have been urged against this lamp, which has now been officially recognized for more than three years (*vide* "JOURNAL," Vol. LXXI., p. 1252)? Professor Stine is silent on the subject, because forsooth he has no accurate knowledge of the lamp either at first or second hand. We make this statement with a page of his work open before us on which is an illustration and description of what purports to be the Harcourt ten-candle pentane lamp. It may be Professor Stine's or some other ingenious but misguided person's modification of the Harcourt lamp; but the Harcourt lamp as officially recognized by the Metropolitan Gas Referees, and as made by the only two houses how have hitherto made it for official purposes in this country, it assuredly is not. Let Professor Stine glance at the illustration of the lamp which has appeared in the "JOURNAL" more than once; and he will see that, whoever supplied him with the illustration and description of what he refers to as the Harcourt ten-candle pentane lamp, grossly imposed upon him. One great advantage of the Referees' present photometer is the abolition of all plumb-lines; but Professor Stine shows a plumb-line as an integral part of his so-called Harcourt lamp. But to indicate the extent of the deviations of Professor Stine's abortion from the genuine Harcourt lamp, we need quote only one passage from his description: "The saturator is connected with the burner by means of brass tubing, though in the first lamps a rubber tube was employed. In the lower end of the connecting tube is placed a small cock. This should always be opened for a minute or two before lighting the lamp, so that any condensation of pentane which may have gathered in the tubing may be drawn off. The small micrometer cock next to the base of the burner should be kept closed during this operation. When the lamp is in use, both cocks on the saturator box should be wide open, and the height of the flame be regulated by the micrometer cock." There is scarcely a statement in this long consecutive extract which applies to the true Harcourt lamp, as those of our readers who are familiar with the lamp will at once perceive.

In the first place, not only was rubber tube employed to connect the saturator with the burner in the first lamps, but it has continued to be employed to the present time. No lamp with a "brass tubing" connection in this place has ever come under our notice; and the official specification of the lamp knows nothing of it. Secondly, there is no small cock in the lower end of the connecting tube. Thirdly—passing over the Professor's inexact use of the word "condensation"—we may observe that it is inconceivable that pentane would ever condense as liquid in this connecting tube, and it is therefore not surprising to find that the provision for drawing off condensed pentane described by him is not found in the true Harcourt lamp. Lastly, in the latter the height of the flame is not regulated by the micrometer cock, for the very good reason that there is no such micrometer cock.

Now these divergencies and discrepancies all touch essential features of the lamp; and it may be safely said that anyone who is responsible for them would not be careful to observe the dimensions and materials of construction of the official specification. Yet, if these are departed from, the lamp, instead of being the Harcourt ten-candle lamp, will become Dick's, Tom's, or Harry's two, five, or twenty candle lamp, and should be described accordingly. Only by strict adherence to the official specification can the Harcourt ten-candle lamp be reproduced. Any deviation entails the standardization of the lamp afresh; and Professor Stine does not seem eminently qualified to carry out such a task. He would probably, from force of habit and inclination, be satisfied if he found his modified Harcourt lamp gave a light of ten Hefner units instead of ten English candles. But it would be gross misrepresentation to style such a lamp the Harcourt 10-candle pentane lamp; and whatever be his object or excuse, Professor Stine has already been guilty of equally gross misrepresentation in the work before us.

We trust the Professor has not knowingly lent his authority to this misrepresentation, but has been imposed upon by someone who prefers that the true Harcourt lamp should not become known in the United States. This, however, is not an adequate excuse; for in a matter of so great importance to photometricians the world over, the Professor should have made it his business to obtain a correct description of the lamp, even if he had not thought it worth while to obtain personal experience of its behaviour. He does not speak of having tried it; and certainly his opinions would be quite worthless if he used such a lamp as that which he describes and illustrates, instead of the true one. But other observers in the United States have recounted their experiences of the Harcourt ten-candle lamp; and we are led to wonder, in the light of Professor Stine's revelation, with what manner of lamp they were obtained. We have heard it said, by those familiar with the Harcourt lamp, that American observers who have given details of trials purporting to be made with it, have found divergencies from its mean value which are incompatible with English experience of the lamp. It would, therefore, be instructive to have information as to whether the Harcourt lamps used by the American observers were correct examples, or whether they were such as the lamp described by Professor Stine. In particular, with what lamps were the exhaustive series of tests made on which Mr. Norris reported to the American Gaslight Association (*vide* "JOURNAL," Vol. LXXVI., p. 1338)? The value of such work would be greatly depreciated in the eyes of English photometricians if there were any doubt as to the genuineness of the lamps used. Professor Stine has raised a host of doubts, which we hope he may be able to dispel.

But with every desire to regard Professor Stine's work in as favourable a light as possible, we are forced by his reiterated attempts to belittle the candle-unit and to exalt the Hefner-unit, to think that he is indisposed to look kindly on any standard of light which, like the Harcourt ten-candle lamp, tends to perpetuate the standard candle as the unit of light. Can any connection be traced between this evident bias and the ostensible purpose of his book, which is primarily a manual on the photometry of arc and incandescent electric lamps? The colour of the Hefner light is indeed much against it for this class of photometrical work. The precise value of the unit would at first sight seem to be of no moment, since the results obtained would, of course, be expressed in terms of "English candles" or "Hefner units" as the case might be; and hence there would seem to be no risk of confusion. We have already quoted a passage in which Professor Stine gives it as his opinion that photometricians "might follow the example, notably of German practicians, and express illuminating power in terms of Hefner units." This seems an innocent enough expression of opinion; but the explanation which follows

—viz., "*Hefner Licht* is the current term in Germany"—somehow rouses suspicion of the sincerity of electricians who prefer to express the lighting power of their lamps in "Hefner units" rather than in the old fashioned "candles" to which gas men are generally tied by statutory regulations.

For, curiously enough, we have not observed that "Hefner Licht (*i.e.*, Hefner light) is the current term in Germany." If Professor Stine will consult modern German technical periodicals, he will find that "Hefner Einheit" (Hefner unit) is at least as common an expression, while "Hefner Kerze" (Hefner candle) is far commoner than either of the others. He must surely know its familiar abbreviation "HK"? If not, he knows very little of modern German photometrical communications. It is this employment of the term "Hefner candle" for a unit which is not of the value of any recognized standard candle, and is produced by a lamp which by no stretch of the imagination could be termed a candle, which leads us to make an emphatic protest against the recognition of the Hefner light as the unit in terms of which illuminating power is to be recorded. "Hefner light" and "Hefner unit" were apparently unobjectionable terms; but they have been generally superseded in Germany by the term "Hefner candle," which conveys an unwarrantable suggestion that the value represented is a "candle," which it most assuredly is not. Already indeed has a further stage of decadence set in; and in German technical papers it is now quite common to find illuminating power stated merely in "candles," which on inquiry prove to be Hefner units, and not candles at all. The Hefner unit is approximately only seven-eighths the value of the English sperm candle; and the electrician naturally prefers to refer to the feeble glow of an incandescent lamp as of 8 Hefner candles value (and shortly afterwards to let the word "Hefner" drop out) than to state honestly that it is only of 7 candles value. Gas managers, in this country at least, cannot practise the same deception on gas consumers. The "candle" is clearly defined in Gas Acts; and no substitute which adds anything to, or detracts anything from, the average value of the standard candle can ever hope to find acceptance with our legislators. According to the nomenclature which is finding favour among the votaries of the Hefner unit, the South Metropolitan Gas Company, would not be said to be supplying 14-candle gas from the 1st of July. It would be 16-candle gas! Though, for all practical purposes, the advent of the incandescent burner has made the gas now supplied as good value to the consumer as the old 16-candle gas, yet the fact that prior to the general apotheosis of the Hefner unit abroad it would have ranked only as 14-candle gas would not be thought worthy of mention. This system of enhancing illuminating value by a happy convention is convenient to the electrician, who is not troubled by any statutory definitions of the "candle." But it behoves gas men to fight strenuously against any such one-sided convention; and as it is the Hefner lamp which is the medium through which the depreciation of the candle-unit is being attempted by electricians and others, we urge readers of the "JOURNAL" to use every endeavour to prevent the acceptance of the lamp as a photometrical standard and of the Hefner unit as a photometrical unit in place of the candle.

Were it not for the author's unreasoning advocacy of the Hefner unit and disparagement of the candle unit, coupled with his inaccurate account of the English pentane standards, which are based on the candle unit, we should be disposed to regard the work before us in a favourable light. It has good points, though the author has an objectionable habit of using abstruse terms of a *quasi*-scientific nature in order to express simple facts. The treatise gains nothing in exactness, and certainly loses in intelligibility, through this habit.

Among points which attracted our attention in the book, a few call for comment. The author says: "The smallest distinct change which the average trained eye can distinguish in the illumination of an object is about one part in one hundred." We think that Professor Stine here rather under-estimates the capacity of the average trained eye. But later on he states that "maximum sensitiveness in the comparison of two illuminated surfaces required them to be placed immediately side by side with edges sharply defined and divided by a very narrow separating line." Putting aside the ambiguity of this sentence, and assuming that the author means that the surfaces shall *not* be placed *immediately* side by side, but shall be separated by a very narrow dark line, we think he is wrong in supposing that maximum sensitiveness is thus attained. The table photometer of the Metropolitan Gas Referees places the illuminated surfaces immediately side by side —*i.e.*, without a separating line; and we believe that experienced observers have found that with this instrument they can distinguish a smaller distinct change in the illumination than one part in one hundred. Professor Stine, however, makes no mention of the particular arrangement of a table photometer which has been prescribed by the Gas Referees since the summer of 1898. Again, he states elsewhere that "the sensitiveness and adaptability of available apparatus for the comparison of lights are now greatly in excess of the reliability of the standard of light." We doubt whether he would have made this statement had he worked with the true Harcourt ten-candle pentane lamp.

Professor Stine is an advocate of all-prevailing blackness in the photometer room. He says that "all surfaces in the room are to be blackened, that they will absorb all light falling upon them;" that the walls and the woodwork are to be painted dull black; that "the chairs, tables, and other furniture, and as well, all switches and fittings should be finished with a dull black surface;" and that it is advisable to coat the floor with a black stain. He does not add the obvious corollary to these elaborate precautions—viz., that the observer must be a negro of the deepest blackness, who has foresworn white linen collars and cuffs. It would be an impertinence for a white man, wearing perhaps a light grey suit of clothes, to pose as a qualified gas examiner in such a chamber of blackness! Well may we ask for how long will instructors such as Professor Stine fail to realize the fate which awaits them in straining at a gnat. But perhaps they cannot clearly discern this small insect in rooms of the degree of blackness to which they have become accustomed. While they are straining after it, perhaps the camel, which we believe is not absolutely black, will be observed, and will escape deglutition, and the situation and their reputation may thus be saved. We hope so.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 580.)

IT goes without saying that the markets of the Stock Exchange, which were in a state of holiday torpor at the time of our last review, had no animation imparted to them in the week just closed. Many absentees had not returned on Monday, and the attendance all through the week was limited; and with the settlement in full swing, fresh business was kept very low. But in spite of all this, there was quite a cheerful tendency prevailing, though some markets, perhaps, might have done a bit better if they had received more support. The chief factor to influence the markets appeared to be the extreme ease of the Money Market, where such abundance of supply was evident that no demands, either for Stock Exchange purposes or any other, could shake it. In the Gas Market, business was at a very low ebb; and all the transactions of the week put together would scarcely suffice to make up a fair show of business for one day. But still it was not devoid of interest. Several changes in quotations were effected; and they were all without exception in the upward direction. In Gaslight issues, the ordinary opened without much show of firmness, and on Tuesday was marked as low as 90. But, apparently on reflection that the position of the Company was strengthened by the capital issues in course of arrangement, a firmer tone supervened; and the quotation was advanced a point. On Thursday, the best price of the week—92¼—was marked. South Metropolitan was in favour; and an improvement of a point was effected in it. Hardly anything was done in Commercials; but the debenture stock commanded a good figure. The Suburban and Provincial group was extremely quiet; but here, too, a buoyant tendency was evident. In the London Market, Crystal Palace and West Ham had a rise; and locally Sheffield improved after the Company's general meeting. In the Continental Companies, business was as limited as elsewhere; but Union preference had a further advance. Among the remoter undertakings, Oriental was again conspicuous in the rise; and Bombay and Buenos Ayres also improved. Business in the Water Companies was on about the usual scale; but the tendency was favourable, and several issues had a slight advance.

The daily operations were very light. Monday was the best day with some moderate business; but thenceforth transactions dwindled away to the smallest proportion. Union preference rose 2 on Monday. On Tuesday, Buenos Ayres advanced ¼. On Wednesday, Gaslight ordinary improved 1, Oriental ¼, and ditto part-paid ¼. On Thursday, Chelsea Water rose 2, and Grand Junction 1. On Friday, South Metropolitan rose 1, West Ham ½, and Bombay ¼. In water, Lambeth advanced 2, and ditto debenture 1. On Saturday, West Middlesex Water rose 1.

BOARD OF TRADE STATISTICS AS TO PROFIT-SHARING.

IN continuation of their original detailed report on profit-sharing, published in 1894, and of subsequent additions thereto, the Labour Department of the Board of Trade give, in the "Labour Gazette" for August, statistics relating to the present position of, and recent progress in, the movement. At the end of June, 1900, there were known to be 84 firms practising the system of profit-sharing, employing from 53,500 to 56,100 hands according to the season of the year. The number of firms in the case of which profit-sharing is now known to be in operation is 82, employing from 53,900 to 56,100 hands. During the past year, it has been ascertained that 7 of the firms reported as profit-sharing in June, 1900, have discontinued the system. The reasons given are various; only one firm, however (employing 94 men), declaring themselves dissatisfied with the results of the system. In two cases the business has been given up; one company has gone into liquidation; two have become limited liability concerns ("stockholders not in sympathy with system"); while one employer gives as a reason, "badness of trade." The total number of employees concerned was just over 900.

Five instances of firms having adopted profit-sharing have come to the knowledge of the Board of Trade since June, 1900—two that were previously in existence but not known to the Labour Department (one of these two adopted profit-sharing as far back

as 1865), and three that have introduced the system subsequently to the last report. These three are: (1) Samuel Gallery, Limited, slipper manufacturers, of Glasgow, employing from 130 to 140 hands. Bonus payable in cash. (2) Willey and Co., engineers and meter-makers, of Exeter, employing 600 to 700 hands. (3) The Chester United Gas Co., with 95 to 115 employees. In the two last cases, it is stated that the bonus will take the form of "part cash, and part provident fund."

So far as the Chester Gas Company are concerned, this description of how the bonus is paid is incorrect. As has been previously stated in the "JOURNAL," the plan adopted is to pay one-half of the bonus in cash, while the other half remains in the hands of trustees on behalf of the men, who may deposit the amounts entrusted to them with the Company at 4 per cent., or invest them in the Company's ordinary or other stocks, or in trustee securities. Every facility is given to the profit-sharers to invest accumulations of bonus in this way, in minimum quantities of £10 of stock.

It will be seen that profit-sharing has made practically no progress since June, 1900; the number of employees participating in the benefits of the schemes in operation remaining constant at about 55,000. This, however, represents a material advance since the original report of the Board of Trade was published in 1894; the number of hands employed by profit-sharing firms being then only some 28,000.

Figures are given showing the ratio of bonus to wages in the case of 66 firms, employing 24,500 hands. Of these, 13 firms paid no bonus; 41 paid 10 per cent. on wages, or under; 10 paid from 10 to 20 per cent.; one firm (employing 3220 hands) paid 38, and one (employing 82 hands, 37 only being profit-sharers) 40, per cent. Excluding the 13 firms paying no bonus, the mean rate was 14·3 per cent.; but taking all firms, the mean rate was 6·4 per cent. These figures compare with 12·1 and 5·4 per cent. respectively in 1899. The mean rate for all firms calculated over a number of years ending 1893 was 4·4 per cent. These figures point to increased profits in the firms adopting the system.

PERSONAL.

Mr. D. FRASER, who for some years has managed the Bridge of Earn Gas-Works, has obtained the appointment of Manager to the Gorebridge Gas Company.

Mr. W. WILSON, of Coatbridge, has been appointed Manager of the Kirkintilloch Corporation Gas-Works, in succession to Mr. John Gibb, who has been appointed Manager at Newton-on-Ayr. There were 39 applicants for the post. Mr. Wilson is a son of, and has been Assistant to, Mr. T. Wilson, the Manager of the Coatbridge Gas Company.

On Tuesday last, Isabel, the eldest daughter of Mr. William A. M'Intosh Valon, J.P., of Ramsgate, was married to Henry Coleman, the eldest son of the late Mr. Henry W. Head, of Clapham. The bridegroom is Assistant-Manager of the Bournemouth Gas and Water Works. The ceremony took place at St. Mary's Church, Kennington, near Ashford.

There were 34 applications for the position of Gas Engineer to the Nelson Corporation, rendered vacant by the removal of Mr. A. Allan to Scarborough. The number was reduced to four, and eventually Mr. A. J. HOPE, Superintendent of the Grimesthorpe works of the Sheffield United Gas Company, was selected. It may be remembered that Mr. Allan was also in the service of the Company before he went to Nelson.

We learn that Mr. WILLIAM DUFF, the Manager of the Morecambe Gas-Works, has placed his resignation in the hands of the Urban District Council, to take effect on the 31st of December. Our readers may remember that Mr. Duff was the Secretary and Manager of the Gas Company, in whose service he had been for 34 years; and on the transfer of the undertaking to the District Council, and the winding-up of the Company, his Directors voted him an honorarium of £2000. Mr. Duff will, we believe, be entitled to compensation under the Morecambe Gas Act; the amount to be determined by arbitration. He is Chairman of the Morecambe Central Pier Company, Limited.

We are pleased to record that Mr. D. FORD GODDARD, M.P., has succeeded the late Mr. G. A. Biddell as Chairman of the Ipswich Gas Company. The name of Goddard has been associated with the Company for many years; the new Chairman and his father (the late Mr. Ebenezer Goddard) having filled the position of Engineer and Secretary over a long period. Mr. Ford Goddard relinquished it after holding it for ten years, at the close of 1886, and Mr. J. T. Jolliffe obtained the appointment, his predecessor joining the Board. He is Chairman of the South African Lighting Association and of the Gas Purification and Chemical Company, Limited, and Deputy-Chairman of the Tottenham and Edmonton Gas Company, at the half-yearly meeting of which on the 24th ult. he presided. He was Mayor of Ipswich in 1891, but resigned just before the General Election the following year, in order to stand for the borough. He was, however, unsuccessful; but he had better fortune three years later, when he was returned at the top of the poll. The confidence placed in him by the Radical party was not only unshaken but strengthened at the election last year, when he held his position with a larger number of votes. As a Member of Parliament, he is not prominent in debate; but those who have an opportunity of watching the division-lists have proofs of the conscientiousness with which he attends to his duties. Being a trained gas engineer, the shareholders of the Company over whose destinies he will, we trust, for years preside, may be sincerely congratulated on securing his services.

OBITUARY.

The death is announced at the age of 67 of Mr. GEORGE BUTCHER, J.P., formerly head of the banking firm of Messrs. Thomas Butcher and Sons, and Chairman of the Aylesbury and Tring Gas Companies and the Chiltern Hills Water Company.

The death is announced, in his 49th year, of Mr. JAMES COOK EASTHAM, who for many years held an appointment in the Water-Works Department of the Manchester Corporation. He entered the service as a boy, when Mr. Charles Wilson was the General Superintendent of the works, and rose to be Engineer of the Longdendale works, under the direction of Mr. G. H. Hill, M.Inst.C.E. When the Thirlmere scheme was adopted, Mr. Eastham became the Surveyor for the Corporation upon the Thirlmere estate, and in that capacity performed an important task in arranging the purchase of easements and wayleaves for the construction of the aqueduct from the lake to Manchester. When his duties in this direction ended, he remained for a while with the Corporation; but about two years since he retired into private life.

By a rather singular coincidence, this page of the "JOURNAL" contains two references to Nelson. In a previous paragraph we notice the appointment of Mr. Hope to the managership of the gas-works, in place of Mr. A. Allan, who succeeded Mr. WILLIAM FOSTER. We have here to record the recent death of the last-named gentleman after a long illness. He filled the position of Manager of the gas-works for 26 years; and it was from his designs and under his supervision that they were enlarged and rendered equal to the growing requirements of the town. He also put up the plant for the supply of electricity, and carried out the work in such a way as to attract considerable attention. He was a member of the Gas Institute for some years, and also of the Manchester District Institution; and he had a number of friends in each body. He leaves a widow and six children. The connection of his name with the gas industry will not be severed by his death, for one of his sons, Mr. John Foster, is Manager of the Leigh (Lancs.) Gas-Works.

We regret to announce the death, early last Tuesday morning, at his residence in Oldham, of Mr. JOHN CHADWICK, Engineer and Manager of the Oldham Corporation Gas-Works. His health had not been good for some months; but he had been confined to his room for only about a week. The cause of death was pneumonia following a chill. It may be truthfully said that the life-work of the deceased was identified with the Oldham Corporation, into whose service he entered at the age of fifteen. In 1870, he was appointed Assistant-Manager under Mr. James Taylor, on whose death four years later he succeeded to the position filled by him, and held it till the last. He joined the Gas Institute in 1875, and the Manchester District Institution (of which he was a Past-President) in the preceding year. He was generally esteemed, not only by the employees, who presented him with a valuable testimonial of their regard on the completion of his forty years' work, but throughout the coal trade of Lancashire. The announcement of his death was received with great regret by colliery representatives on the Manchester Coal Exchange, at the meeting last Tuesday; and the flag at the Oldham Town Hall was hoisted at half mast. Mr. Chadwick was a prominent Freemason, and had held some of the highest local offices. He was in his 58th year; and he leaves a widow and one son (Mr. William Chadwick), who is a solicitor at Oldham. At the funeral at Chadderton Cemetery on Thursday, there was a large representative gathering of friends of the deceased. At the meeting of the Gas and Electricity Committees on the previous day, resolutions of condolence with Mrs. Chadwick and the family were passed; while the Mayor (Mr. J. Hood), at the opening of the Robin Hill Baths, expressed his great regret that the town had lost one of the oldest, most faithful, and best servants it ever had.

New Iron-Making Process.—A report is in circulation that Mr. Enoch Gittings, jun., of Walsall, claims to have discovered a new process whereby iron can be manufactured without the process of puddling. He told the representative of a daily contemporary, to whom he showed some specimens, that his iron is "silky, pure, and white," and that it "stands the greatest combined test in tensile strain, elongation, and reduction of area of any other steel or iron the world over. It is better than basic, Bessemer, or Siemens-Martin soft steel, or even Swedish Bessemer." The process is said to be due to the discovery by Mr. Gittings of a new law of Nature—"Godocity." He says he has "gone down to the atom, in which are generated electricity, light, heat, magnetism, perpetual motion, and force of Nature," and has applied the new law to iron making. This valuable metal is, we learn, to be produced at 50 per cent. less cost; and two men will be able to do the work of a hundred puddlers. Needless to say, Mr. Gittings requires a high price for his discovery. He requires "millions," to work out his other inventions, which are reported to include "a machine for superseding the steam-engine and the abolition of coal, and an effective plan for utilizing the energy of tides."

TECHNICAL RECORD.

MECHANICAL CONVEYING OF COAL AND COKE IN GAS-WORKS.

By M. Henri Laurain, of Paris.

[A Paper read at the Annual Meeting of the Société Technique.]

The De Brouwer conveyors have already been described before the members of the Société Technique; and at the International Congress of last year, we were able to see, by the various descriptions given of works, how the use of such plant abroad has extended rapidly. In France, gas managers have been a little more cautious, though it seems that lately a very distinct tendency has shown itself towards the adoption of conveyors for all new installations which are being put up. It is to be anticipated that this tendency will also lead gas engineers to apply them to existing plant. Notwithstanding the hesitation to which I have just referred, the Continental Company for the manufacture of gas-meters and other apparatus, who are the sole agents in France for the De Brouwer patents, have in particular been able to put up a certain number of plants, among which are some very important ones. Nearly all the members of the Société Technique have seen the installations at Fontainebleau and Saint-Quentin. Since then we have put up plant at Rheims, Albert (Somme), Rouen, Dijon, and Havre, and we are now just finishing one at Lyon-Vaise for M.M. P. de Lachomette et Cie.

When M. De Brouwer designed his apparatus, he only had in view the quenching of the coke coming from the retorts, and its transport or conveyance outside the retort-house. Afterwards, M. Rouget conceived the idea of applying the same conveyor, or that part of it forming the return chain, to bring the coal in front of each of the retorts in a bench to be charged; and at the Nice meeting he himself described to you the general arrangement of a double-acting conveying plant.* He has also had the idea of combining the De Brouwer apparatus with all the accessories required for breaking the material, sorting, and placing it in store or in carts by mechanical means. Since the reading of the different papers to which I have just referred, certain crude arrangements have been modified, following reports made on the plants in daily work, and indisputable results have been obtained; and it is exactly these alterations and results which I wish to discuss to-day. I have just said that some of the results obtained were indisputable; and I trust to justify this expression by simply saying that it is precisely these results which, by being spread among French gas managers, have started the forward movement to which reference was made at the beginning.

No one now disputes either the utility or the advantages of adopting hot-coke conveyors; and one is entitled to ask why they are not more used in France. I believe they are not sufficiently well known; and it is for this reason that I thought it might be useful to speak of them at some little length. For the sake of greater clearness, I will divide the investigation into two parts. In the first I will deal with the mechanical conveyance of the coal up to, and its deposit in, the retorts; in the second, with the mechanical conveying of the coke coming from the retorts up to and including the putting of it into sacks, carts, railway trucks, or heaps—all, of course, after sorting.

First Part.—The Handling of Coal.

In this portion of the paper, I shall have to consider in succession the following subjects: (A) Heaping the coal in the stores. (B) Bringing the coal in front of the retort-arches. (C) Charging the retorts.

A.—*Heaping the Coal.*

The problem of heaping coal in the stores has been put very clearly to us by one of our members, who had to deal with an amount corresponding to a yearly carbonization of 50,000 tons (metric), under the following conditions: The coal arrives at the point T (fig. 1) by means of carts, which are filled at the port, and it is required to place it in a heap, 4 metres (13 ft. 1¾ in.) thick on the vertical line, in one of the three compartments of the coal-store, arranged as shown on the diagram. The problem was solved in the following way: At A is provided a chain of elevator buckets, which receive the coal brought to the hopper *a* by the carts, which are emptied at T. This elevator delivers the coal into the trough of a primary horizontal conveyor B, which divides the stores perpendicularly at their greatest length. In each of the three compartments of the store, there was placed an auxiliary conveyor C. All these conveyors can receive the coal carried by the transverse conveyor B through trap-doors made in suitably chosen places. It follows that if the elevator, the transverse conveyor, and one of the auxiliary conveyors are working together, by opening one of the traps made under this conveyor the coal deposited at T may be carried mechanically to any point whatever in the store. The work of placing coal in store will therefore be reduced to working some trap-doors by hand; and the heaping will be done much more quickly, owing to getting rid of the inevitable hindrance caused by carts being in the compartments of the coal-store. The speed of unloading the boat will depend solely on the power of the elevator A and on the carriage by carts.

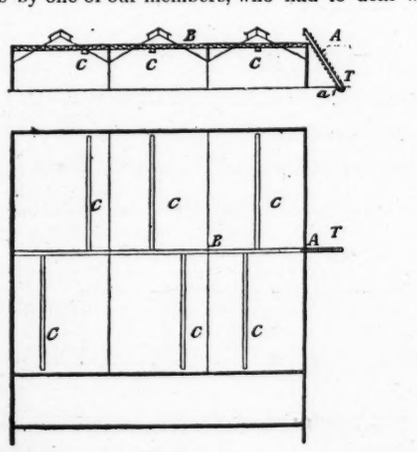


Fig. 1.

B.—*Bringing the Coal in Front of the Retort-Arches.*

If we take the coal from the heap in the store, we have first of all to bring it to the hopper T^1 (fig. 2) of an elevator, which is generally placed outside the retort-house. When it is working with benches of back-to-back retorts, the elevator N^1 will have to feed both sides of the same bench. For this reason the elevator is placed on the centre line of the bench, and at its top part is provided, at D, with a hopper, with movable slope, which allows of guiding the coal supply into one of the two shoots G, which throws it on to the return chain of the De Brouwer conveyor, arranged along the façade to be worked. As the chain travels in the direction of the arrows, it will be seen that the coal can be led along this façade to the desired point. For this it will be sufficient to provide a set of slide doors in the wide bottom of the upper trough, which will allow the coal to fall into the chambers of a tank W, which runs the whole length of the front of the bench at about the height of the hydraulic main. It is from this tank (which is, in fact, only an intermediate one) that the charging apparatus will be supplied with the necessary quantity of coal for the different retorts.

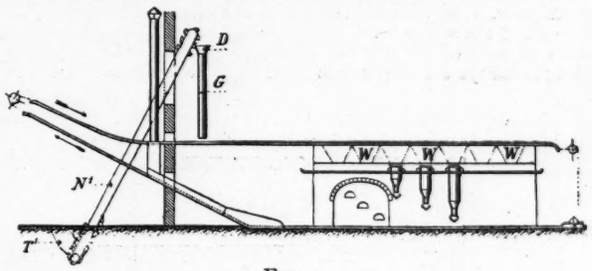


Fig. 2.

The existence of this intermediate hopper would not appear at first sight to be justifiable. But this is not so, because, in order to effect an economical and reasonable working of the conveyor chain, the latter should not be put in action specially for carrying coal; on the contrary, one must take advantage of its working during the time of the draw. To accomplish this, the two distinct operations of charging and drawing should not be absolutely and jointly combined, and therefore it is necessary to arrange for a certain give-and-take. This is precisely the duty which the intermediate tank fulfils. It will allow of regulating the sequence of the different operations of charging, so as to have in each case the minimum of labour, the minimum of fatigue for the staff, and also the minimum of time for the working of the chain. This last point is very important in order to effect economy in motive power, and in the maintenance charges of the plant. This intermediate hopper is also easily put into position, as it can be placed on the brackets which have to carry the guides for the return chain, and as the bottom of the upper trough will be formed by the top framing of the girder of the tank itself. To bring the coal from the store to the hopper T^1, one can use, according to circumstances, either tip-waggons or a conveyor, such as has been described for heaping the coal. Local circumstances will decide the choice to be made in each particular case.

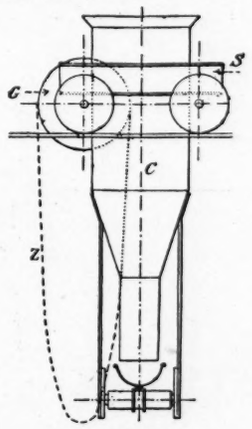


Fig. 3.

* See "Journal," Vol. LXXI., p. 1469.

C.—*Charging Apparatus.*

These machines are of three different weights—one to serve each tier of retorts on the same level on either side of the arch. Apart from this question of the length of the cylindrical portion, the three machines are the same, and it will be sufficient to describe only one of them. Each charging apparatus is made up of a cylindrical hopper C (fig. 3, p. 567), the upper part of which is fastened to a portion which is slightly widened out to form a funnel. This hopper is supported by a little carriage S, with four rollers G, which run on a track hung from the intermediate tank. A chain *Z* comes down to the height of the workman's hand, and enables him to bring the hopper under the door of the intermediate tank, which supplies it with coal. The lower part of the hopper is cone shaped, continuous with which is the shutting-off gear; and under this is placed a support on rollers for the purpose of carrying the ordinary scoop, as used at present in a large number of gas-works. The opening and closing mechanism above the scoop is most simple, and is automatically worked by the scoop itself. Two cleats have been placed on the side of the scoop—one in the front on the left, and the other at the back on the right. The first acts in passing on the opening lever, and the second on the closing lever, when the scoop is charged.

The apparatus is worked by two men, or by only one man. In the former case, the front part of the scoop is placed on the supporting roller underneath the hopper, the other end, having the handle, being held by a workman, or better by the carrying strap fastened by a chain to a little carriage running on rails parallel to the bench. To work the apparatus, one of the men, whom we will call A, stands by the side of the chain actuating the hopper, while the other, B, who is the actual stoker, stands at the end of the scoop holding the handle. A will bring the apparatus in front of the retort to be charged, while B will also move along sideways with it; and as soon as the machine is in front of the retort, he will step forward, pushing the scoop into the inside of the retort. The left cleat will come in contact with the closing arrangement, and open it, and the coal will flow into, and spread over, the scoop (the theory of the natural angle of repose not entering into consideration) up to the moment when the right cleat will act upon the closing lever, just as the scoop is full. The stoker will then only have to make a last effort to push the scoop to the bottom, turn it over, and pull it back. He will begin again for the second half of the operation of charging the same retort. The charge will therefore be made with two scoop-loads, each having half-a-charge. When the man B returns after the second time, A will work the chain so as to move the hopper, and free the mouthpiece of the retort charged; he will then shut the lid, and be ready to pass on to the next retort. If before leaving the chain he has brought the hopper in front of a retort ready to be charged, and if the hopper contains enough coal for a second retort, B will be able to charge it, while A is shutting his lid. If, on the other hand, the hopper is empty, he will have to place it underneath a filling door, so that the operation of filling may be done during the time the lid is being shut.

When one man is employed, the machine is only intended for small works, in which the night staff is reduced to but one stoker. He will begin by drawing his retorts, and then fill the apparatus corresponding to the height of the tier on which he is working. By means of the chain, he will bring the hopper in front of the retort to be charged, and will then place himself at the scoop-handle. He will work as already described for the charging of the retort, return to the chain, move the hopper along, close the retort-lid, and pass on to the next one. We believe we have thus solved the problem of charging retorts by scoop with only one man. It is obvious that his work is much reduced, as he will not have to trouble himself about the coke which will be quenched and carried away by the conveyor.

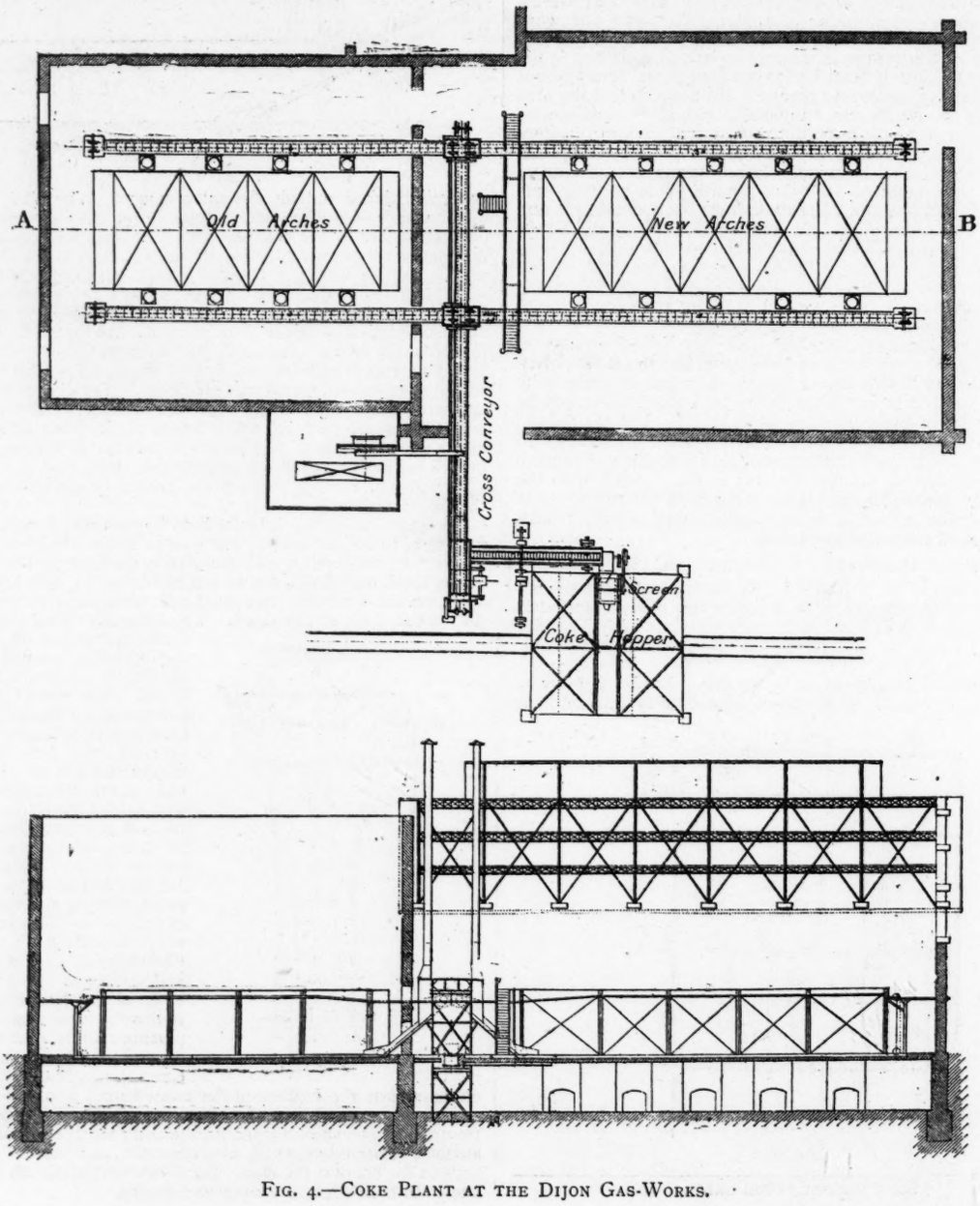


Fig. 4.—Coke Plant at the Dijon Gas-Works.

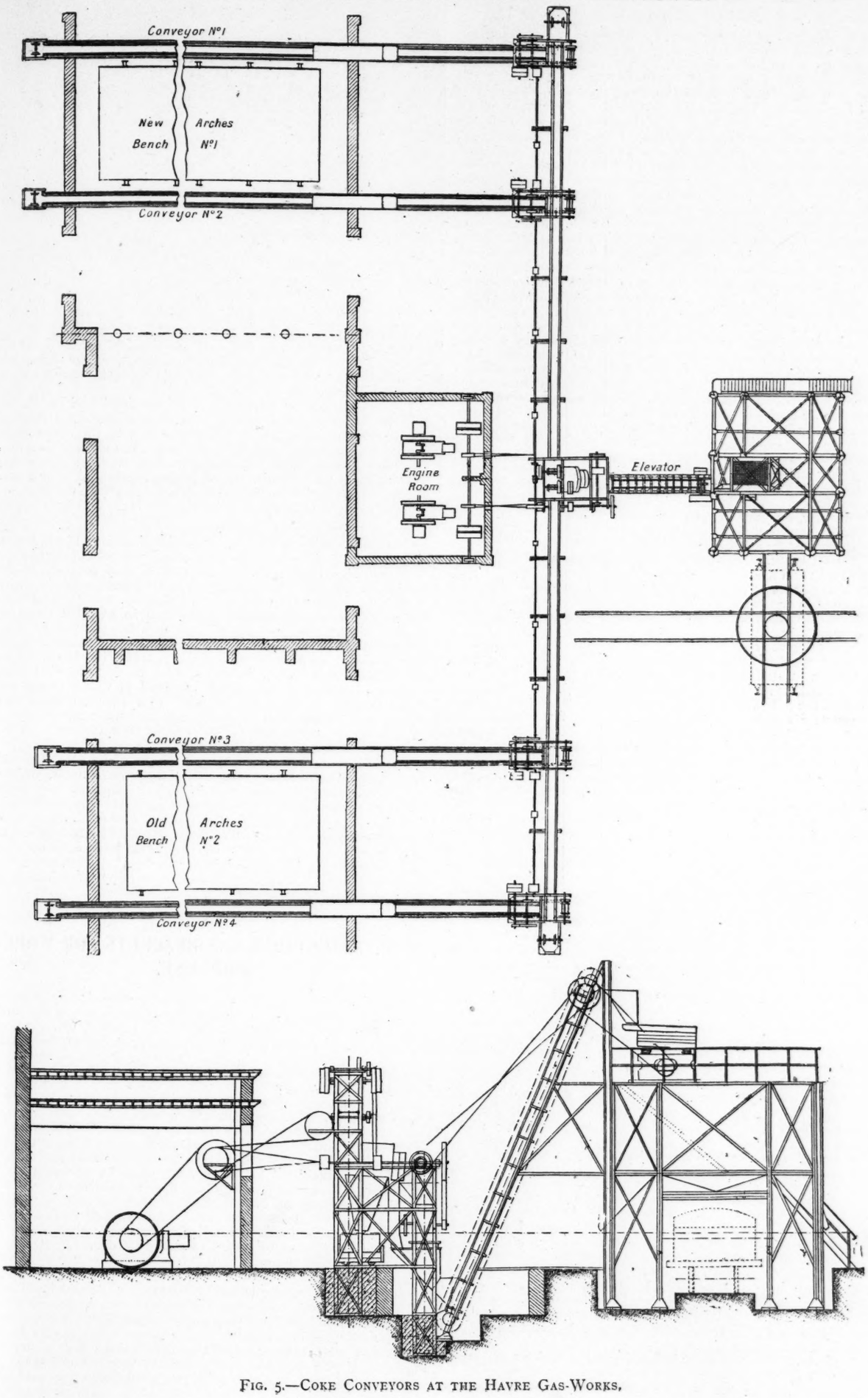


FIG. 5.—COKE CONVEYORS AT THE HAVRE GAS-WORKS.

SECOND PART.—THE MECHANICAL CONVEYANCE OF COKE.

We have carried out the whole programme of conveying the coke from the retorts to carts or heaps in the installation which we put up, at the end of the past year, at the Dijon works of the Compagnie Gaz et Eaux. It was there required to convey the coke resulting from the carbonization of 25,000 tons (metric) of coal per annum. The plant was applied to the whole of the arches arranged back to back in two benches—one including ten arches and the other eight arches. These two benches were arranged in a line, one after the other, as shown in fig. 4 (p. 568). The mechanical part of the installation includes four hot-coke conveyors, each serving one range of arches, all the four throwing their quenched coke into a collecting elevator, placed transversely between the two benches. Each conveyor has a quencher, increasing the duration of extinguishing; each quencher being provided with a chimney for carrying above the roof the steam produced by quenching. The coke lifted by the conveying elevator falls, first of all, on to a double shaking-screen. The first passing of the coke over this screen is intended to remove the moist dust, which, if kept in contact with the coke, would find its way into the many small holes of the large pieces. When these become rather dry, the dust is released, and thus the sorted coke is made dirty by it. After this elimination of the wet dust, the coke is made to pass over the second part of the screen, which has a bottom made of a perforated sheet, with holes of a diameter which only allows the passage of the pieces that are already of a size to be classified. In all our work, we have acted on the principle of only carrying to the breaker the coke which needs breaking, effecting *en route* what we call the "first sorting."

The coke which has passed through the screen, and that which comes from the breaker, is brought together in the same hopper supplying an elevator, which lifts and throws the coke on to a Cox screen, with shuttle-sieves added. The screen itself is placed above the coke-tank, so that the different classes of sorted coke fall directly by gravity into its compartments. We also use cylindrical screens, if they are preferred by our clients. We are not infatuated by any type either of coke-breaker or of screen, as we use all kinds. The drawing clearly shows the shape of the coke-tank; and it is easy to see that it is only necessary to open one of the doors to discharge in bulk, into a cart below, the coke contained in one or other of the compartments. If circumstances require it, the cart can easily be replaced by a railway truck or tip-waggon, &c.

For putting the coke into sacks, on both sides of the tank there are slide openings, either with or without hectolitre measurers. The different sliding doors already referred to have been carefully studied, as it was, in fact, difficult to close them easily, so as to cut off the fall of coke sharply and cleanly. We have, however, arrived at a simple solution, which gives full satisfaction. The question of filling the elevator buckets has also been fully considered, and the form of the feeding hopper has given every satisfaction at Dijon. The double shuttle-screen can also advantageously be replaced by a small cylinder with two rings. Its adoption avoids the vibrations and shocks caused by the cams working the shuttles.

The general arrangement of the plant at the Havre Gas-Works, which is for the conveyance of coke from the carbonization of 45,000 metric tons of coal a year, is shown in fig. 5 (p. 569). As will be seen, there are four hot-coke conveyors, all ending in a common conveyor, which takes the coke either to the heap or to the breaking and sorting shed—the latter being similar to that at Dijon. The coke-tank contains 1500 hectolitres.

I have spoken of two very important installations; but it must not be forgotten that the processes just described are applicable to small and average works, with as many advantages. In this connection, the example of the works at Albert (Somme) is altogether conclusive. These works carbonize about 2500 metric tons of coal per annum—that is to say, one-tenth of the quantity carbonized at Dijon. The plant includes a single hot-coke conveyor working a bench of three arches in line. The coke falls into the hopper of a small coke-crusher, and an elevator lifts the broken coke to a cylindrical screen, which separates it into its divisions. The coke is also put into sacks automatically. My colleague, M. Deschamps, was bold enough to recognize at the outset what services could be rendered by mechanical appliances. He did not await the results of large installations, as his plant has been working since 1898. From that time, he has stated that, among other things, he has effected a yearly economy in labour of 1800 frs. (£72). We shall see by the figures which follow that this saving is very nearly proportionate to that realized by bigger plants.

At Dijon, thanks to the kindness of the Directors of the Compagnie Gaz et Eaux, it has been possible to follow closely the working of the plant; and I am pleased to give the average results of a great number of tests. It is somewhat difficult to compare the different aspects of the coke service from the retorts to its leaving the works, as it is carried on by hand (as is generally done), and as it is effected by mechanical means. The operations are not, indeed, the same in the two cases. Nevertheless, I shall try to make some restricted comparisons, and will conclude with a general one. The latter is the most correct and the most interesting.

In the first case, the quenched coke is in the barrow; in the second, it is also quenched, but it is elevated and ready to be thrown into the hopper of the coke-breaker, without additional labour.

Quenching and Conveying Outside.

	Without Mechanical Conveying.		With Mechanical Conveying.
Average duration of the charge from the opening of the first lid up to and including the quenching of the last barrow of coke taken away, in minutes-men by retorts	14·9	..	8·2

Difference in favour of mechanical appliances—

$$\frac{6{\cdot}7}{14{\cdot}9} \times 100 = 41 \text{ per cent.}$$

Breaking and Sorting.

In the first case, it is necessary to take the coke in the barrow and carry it to the breaker, then empty it into the hopper, and afterwards put it into sacks or into heaps. In the second case, all this work is done at once.

	Without Mechanical Conveying.		With Mechanical Conveying.
In 300 working days per year there were employed per day—			
Men.	14	..	2
Horses	2	..	0

Difference in favour of mechanical appliances—12 men and 2 horses.

The only men required by the mechanical plant are two mechanics (one for the day and the other for the night) for attending to the driving-engine and for the regular maintenance of all the apparatus.

To sum up, and without going into the details of the wages paid to the different classes of men dispensed with, it may be stated that the reduction in the staff, owing to the adoption of conveyors, elevators, breakers, and screens, has been 20 men and two horses during 300 working days. The men on 365 actual working days have been reduced proportionately to men at 300 days. Applying the rate of wages in force at Dijon, we have—

$$\left.\begin{array}{l} 20 \times 300 = 6000 \text{ men-days} \\ 2 \times 300 = 600 \text{ horse-days} \end{array}\right\} = 25{,}800 \text{ frs. } (£1032).$$

This amount will be still higher when the plant is fully employed, because at present only 18,000 metric tons are carbonized, instead of eventually 25,000 tons. If we reckon 2800 frs. (£112) per annum as the cost of supplying renewal pieces, oiling, &c., we shall have a net yearly saving of 23,000 frs. (£920); and consequently, when we say that plant, such as has just been described, ensures an economy of 75 c. to 1 fr. (say, 7½d. to 10d.) per ton of coal carbonized, we are under the real figures. Also, as we foresaw in speaking before of the plant at the Albert works, the figures given by M. Deschamps for these little works are entirely confirmed by the results obtained in works nearly ten times larger. It must be admitted that between these two extremes the results will be practically the same; moreover, we shall have an opportunity before long of verifying what, in installations in prospect, has been stated.

In conclusion, I may sum up by saying that I wished to show very briefly what we have been able to do towards improving the various mechanical appliances of which descriptions have been given in preceding papers. You were able to see, at the last congress, that such plant is much adopted abroad. You have learnt that those who use it in France have not been deceived in their hopes. As was stated at the beginning, apart from the now indisputable question of economy, the general situation gives these mechanical appliances a degree of importance that will not be overlooked by any of you.

SOME ADJUSTABLE GAS-BRACKETS FOR WORKSHOP USE.

Incandescent gas lighting has found more extended application in many Continental towns than in this country, for reasons with which most readers of the "JOURNAL" are familiar. In addition, however, to the well-known grounds of popularity of the incandescent system of lighting in most European countries, and more especially in Germany, there is no doubt that, as a rule, greater efforts are made by gas undertakings there than here to popularize the system. An illustration of the earnest endeavour of the management of a German gas concern to meet the rivalry of other methods of illumination is afforded by the action of the German Continental Gas Company in manufacturing at its shops at Dessau a number of adjustable brackets and pendants of original design, specially adapted for incandescent lighting in workshops and factories. These admirable fittings have already led to the successful introduction of incandescent gas lighting in many places for which it would otherwise have been ill-adapted, and would have given place to the electric light or some other means of illumination. Hence we offer no apology for directing the attention of readers of the "JOURNAL" to some of the designs, which have already found extensive application in Germany.

In designing brackets and pendants for incandescent gas lighting, it is necessary to bear in mind both that the incandescent burner is a comparatively costly and complicated contrivance—entailing the use of a chimney, and a mantle which is very easily shattered—and that the body of the burner casts a shadow directly beneath it. The problem is, therefore, far more difficult than any presented in the design of brackets for flat-flame gas-burners. In Germany, however, the burners and mantles are cheaper than

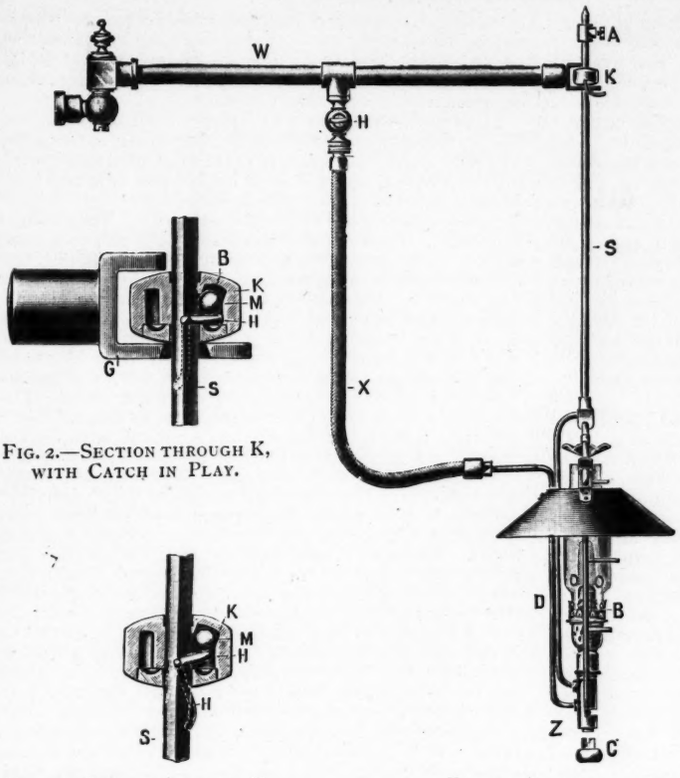


FIG. 1.—LAMP ON A SIMPLE WALL-BRACKET.

FIG. 2.—SECTION THROUGH K, WITH CATCH IN PLAY.

FIG. 3.—SECTION THROUGH K, WITH CATCH RELEASED.

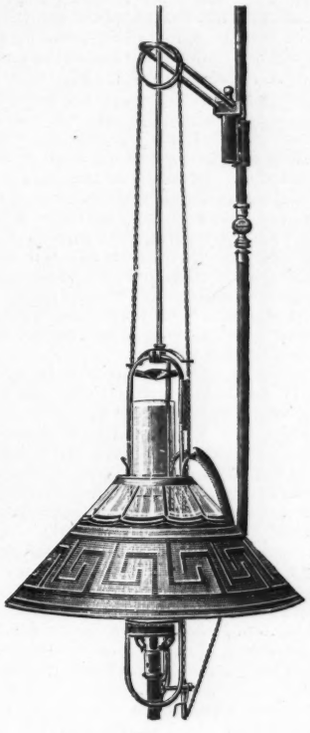


FIG. 5.

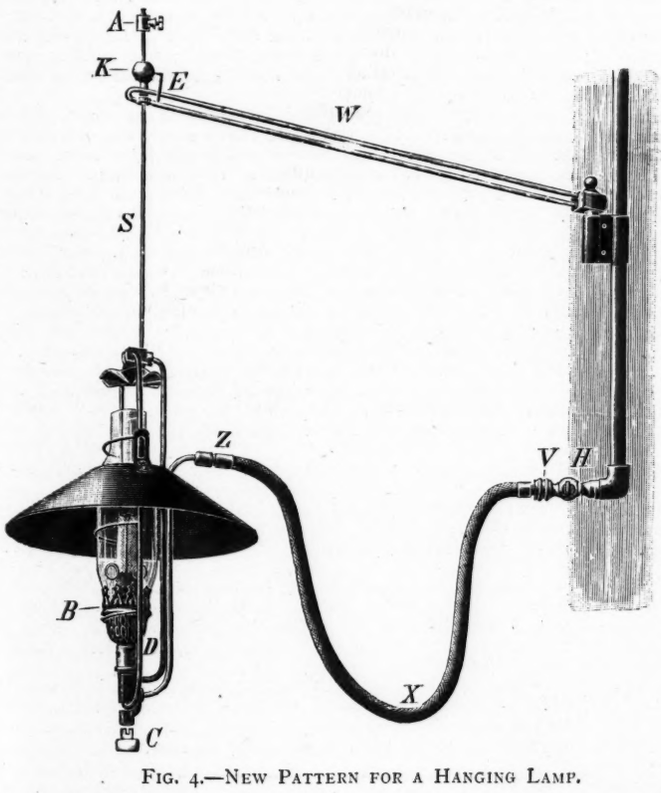


FIG. 4.—NEW PATTERN FOR A HANGING LAMP.

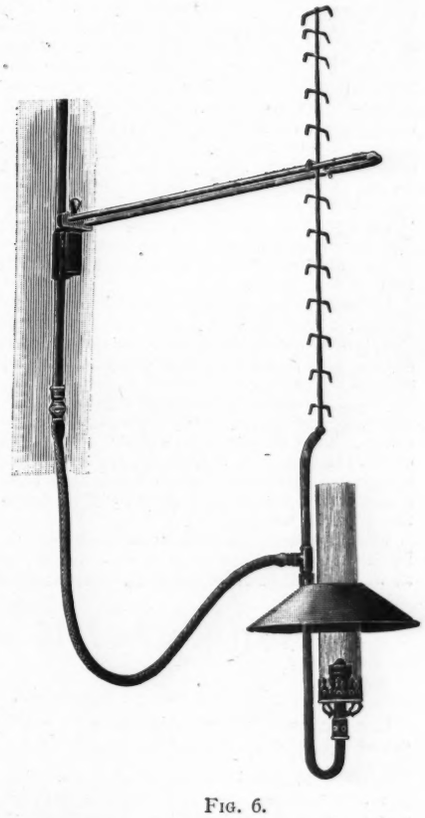


FIG. 6.

here, owing to the absence of master-patents; while the Jena chimneys which are commonly used are very durable and tough. As durable mantles and chimneys are obtainable at very moderate prices, the cost of maintaining incandescent gas-burners there becomes less than the cost of renewing electric lamps. Unfortunately, mantle monopolies, fancied or real, have succeeded in keeping up prices in this country; and therefore it is even more important here than in Germany to secure fittings which tend to minimize the expenses of renewals of mantles and chimneys.

Fig. 1 of the above illustrations shows a bracket made at the Dessau workshops of the German Continental Gas Company for the lighting of a working bench or table. It is intended merely to give a good light on the work in progress, and is not for the general lighting of a room. An attempt to use pedestal stands on the working bench had proved a failure, as the vibration rapidly destroyed the mantles. Hence the wall bracket with a flexible gas connection, as shown, was tried. It was first employed with "Gem" burners, which consumed about 2·12 cubic feet of gas per hour, and gave a light of 35-candle power with new mantles, and of rarely less than 26-candle power with those

which had been in use some time. The small mantles are more durable than those for the larger burners; while less heat is radiated, and the weight of the burner is smaller. The arrangement of bracket shown in fig. 1 admits of the burner being pushed up at will above the workman's head; of it being moved sideways; and of it swinging freely. The wall bracket may be either a single-arm one, as shown, or one jointed also in the middle. The burner B is hung by the wire framing D from the polygonal rod S, which passes freely through the ball-shaped body K, and is provided at the top with a stop A, which limits its movement downwards. The body K rests in the fork G (see fig. 2) on the end of the wall bracket W. Inside K is a passage B, at a slight inclination to the passage for the rod S. In B a small steel ball M moves freely—acting as a stop for the rod S, and retarding its downward passage through K. But when the rod is pushed up, the ball merely rises into the passage B, and does not obstruct the upward movement of the rod. Thus, when the lamp is pushed up, there is only the resistance offered by its weight to be overcome; but as soon as an attempt is made to pull it down, the ball M clamps it tightly.

In order to admit of the lamp being pulled down, a bent wire lever H is inserted beneath the ball M; so that one of its arms protrudes below the body K. The stop is released by means of this lever (see fig. 3), either directly by hand or indirectly by turning round the lamp until the lever H strikes against the fork G. In the latter case, as soon as the lamp is brought to the required position, the rod is turned back, and the stop M at once holds it in position. Thus both for raising and lowering the lamp, only one hand is required; and the lamp remains in the position in which it is put. The shape of K allows the lamp to swing freely. The wire-framing D serves to protect the chimney from injury, and is also so arranged that the upper halves of the burners cannot be lifted out and exchanged by workmen until the framing is unfastened by a key, which is intended to be kept by the foreman. The gas is brought to the burner through the flexible tubing X. This should, for choice, be the Caldwell spiral flexible tubing, which, though more costly than india-rubber tubing, lasts three times as long, and is not destroyed by contact with a flame. The shade over the burner is enamelled white, and can be moved up and down on the frame, so as to reduce or enlarge the area which is brightly illuminated.

This type of bracket has been used, with both the "Gem" and the ordinary ("C") Welsbach burners, in all the shops at the Dessau factory, in composing rooms, draughtsmen's rooms, offices, and various workshops. The light of the small and economical "Gem" burner is, by means of the screen, concentrated on the work in hand, and the results have proved most satisfactory. Even in Germany—where gas is, generally speaking, more costly than here—the lighting of workshops, &c., is thus carried out more cheaply and more satisfactorily than with acetylene or electric lighting, after making allowance for all renewals of mantles and chimneys. In the Dessau workshops 120 "Gem" burners were installed; and after 150 days' use, there had been 155 mantle renewals (many mantles, however, were uninjured at the end of the period), 45 new chimneys were required (two-thirds of the chimney breakages occurred in the smith's shop), and 37 new mantle props.

Recently some improvements have been made on the bracket described above. Fig. 4 shows a new pattern for a hanging lamp. The forked wall bracket W turns in the socket which embraces the gas-pipe; and the lamp can be pushed in or out along the fork W by means of the rod S hanging on K. Fig. 5 shows a pattern in which the lamp is supported by a chain from a ring, which travels on the forked bracket. The chain passes through a catch at the bottom of the burner. By pulling the free end of the chain, the burner is drawn up, and by loosening the catch, it is lowered. Lastly, fig. 6 shows a simple and cheap pattern, in which hooks on the rod support the burner from the forked wall arm at the required height.

The adjustable bracket, in its varied forms, is known generally by the name "Industrina." It is, of course, applicable to pendants as well as wall brackets, and has been so used in many cases.

WATER SUPPLY IN JAPAN.

The Tokyo Water-Works.

Our contemporary "Engineering" recently published an illustrated description of the above-named works, from which we take the following particulars.

Water was first brought into Tokyo from different sources by canals and wooden pipes about 200 years ago, during the Tokugawa Dynasty. The new system of water supply is the result of much deliberation on the part of the City Council, and is all based upon the most approved foreign practice. The district supplied with water is the whole of Tokyo City. At present the population is about 1,200,000, and the water is provided for 1,500,000—giving each person 25 gallons a day. But, with very few alterations, should the population reach 2,000,000, the works can be so arranged as to meet the greater demand. The source of the supply is the Tama River, which furnishes very pure water, suitable for a large city.

Settling Tanks.—The water from the new canal runs into these. There are three tanks with a total capacity of 56 million gallons of water—that is to say, they can supply 1,500,000 people for 1½ days. These tanks are each 720 feet long by 340 feet wide and 20 feet deep; and there is spare ground, should it be found necessary to increase their number. The building of the tanks occupied a little more than four years.

Filter Beds.—The water is brought from the tanks into sand filters; the maximum rate of filtering being 10 feet in 24 hours. The filter area is 600,000 superficial feet divided into fourteen beds, each of which is 258 feet long by 168 feet wide and 9 feet deep. There are, besides, four spare beds for use.

Storage Reservoirs.—These are situated at Yodobashi, Hongo, and Shiba. Each reservoir is divided into two parts, and has a brick roof, to prevent refuse and dust from polluting the water, and also to keep the sun's rays from causing vegetable growth. The reservoir at Yodobashi took a little over five years to build. After working at that of Hongo for 2½ years, and nearly completing it, it was found that the ground was not altogether suitable; and it was decided to stop work, and give it a lengthened trial. But as nothing untoward happened, the work was resumed, and completed about six years after commencement. The Shiba reservoir took a little under three years to finish. The water is delivered to the high-lying districts by pumps from the Yodobashi Station, and for the lower parts of the city it flows by gravitation to the Shiba and Hongo reservoirs, whence it is distributed by the same process. There are four pumps at the Yodobashi Station, one of which is spare. Each pump is of 306-horse power; and its utmost capacity is about 6¼ million gallons of water per 24 hours. The head is from 80 to 100 feet. When three pumps are at work, there will be six boilers in use and six additional spare ones. There is a 25-horse power dynamo and engine for the electric lighting of the Yodobashi works and pump-house.

Cast-Iron Water Pipes.—These range from 44 down to 4 inches in diameter—twelve different sizes in all—with a total length of 525,000 yards. With the exception of some of the straights and specials, the pipes were imported from Belgium and Great Britain, and about 15,000 tons in all from Scotland. Pipe laying was commenced in September, 1894; but it was much delayed because of the trouble with the Japan Foundry Company. The pipes from Belgium were the first of those ordered from abroad in 1895 to arrive. The work of laying them was continued as the pipes gradually came to hand.

Water-Pipe Accessories.—There are 2250 sluice-valves, large and small, and 263 waste-water meters. The latter, on special occasions, can be used as fire hydrants. There are also 3442 fire hydrants, and in different parts of the city there are air and water pressure valves. The large-sized sluice-valves, air-valves, and safety-valves were imported from abroad; the smaller sizes, together with the hydrants and waste-water meters, were made in Japan.

Cost.—The estimated cost of the whole work was 8,500,000 yen (about £850,000). This amount has been nearly all expended on the work to date. City water-works bonds have been issued from time to time to raise the money. Their face value is 100 yen, bearing 6 per cent. interest. Some have been issued above par; the latter issues were at 95 yen. They are redeemable within 30 years from the date of issue. The Imperial Government made a grant of 2,942,000 yen to the water-works for the purpose of paying interest on the bonds. This amount was not paid down in one sum, but is received at the rate of about 150,000 yen per annum. The works are not subject to any land or other tax.

Supply, Fittings, and Charges.—About 20,000 houses are using the water, and it will be some time before all the applicants can have it laid on. All the brass water fittings in the houses were made in Japan; and at least half of the lead piping used was manufactured in Tokyo. The charges to consumers vary according to circumstances. For a household with one tap for five people, the charge is 5 yen (about 10s.) per annum; and for every extra five people, 2 yen additional. For six households combining to use one tap in common, the charge is 8 yen a year, and 50 sen (about 1s.) extra for every additional household. Water can be taken by meter, and the meters either rented from the water-works or privately owned. In the former case, the rent is from 3 yen per year for a 12-millimetre meter to 75 yen for one of 250 millimetres in diameter. In the case of privately-owned meters, a fee has to be paid for testing each meter, of from 1 to 15 yen, according to size. The charge for water by meter is 4½ yen for users of any quantity up to 22,000 gallons a month, and 4½ cents for every extra 220 gallons.

Professor Nakajima Yeji is the Engineer who has been responsible for most of the work. He is a Professor in the Imperial University, and has been allowed by the authorities to take the construction of the water-works under his care.

TESTS OF LARGE WATER-METERS.

A recent number of the "Engineering Record" contained some particulars in regard to a series of tests of large water-meters carried out by the National Meter Company with the unique meter-testing plant they have erected at their extensive manufacturing establishment in Brooklyn. It was designed by Mr. L. H. Nash and Mr. J. H. Norris, members of their staff, to afford means for making accurate tests of meters up to 48 inches in size. The most important test carried out with this apparatus was on one 20-inch and two 36-inch "Gem" meters for the Jersey

City Water-Works. It was superintended by Mr. A. S. Tuttle, as the representative of the city, and Mr. C. D. Ward, who was associated with the Engineers of the Company. Before giving the results of the tests, it may be of interest to describe the arrangements for making them.

The testing plant is a masonry basin about 24 feet by 40 feet in plan, divided by interior walls so that the water may be made to flow continuously round its sides. Meters of such large size as even the smallest (20-inch) tested in these experiments would use far more water than could be allowed to run to waste; so the principle of the plant is to admit to the basin enough water to fill it partially, and then put this in continuous circulation. The water is raised at one point by a centrifugal pump to an elevation which will give sufficient head to force the desired amount through the meter. It passes from the pump through a screen into a small forebay, and thence flows into, and through, the meter to be tested. From the meter it is discharged into a small chamber where it is deflected to the right, flows about 8 feet, and is again deflected to the right. It then enters the main weir chamber, which is 33 feet long, 12 feet wide, and 6 feet deep below the level of the weir crest. The water passing over the weir falls into the pump well, and is again elevated so as to pass over the same route. The depth of water on the weir is measured by a hook gauge and by an automatic float, which keeps a record on a sheet of paper fastened on a drum rotated by clockwork. In order to prevent eddies, baffle-boards are placed in the main weir chamber.

The weir crest is of cast iron with a planed edge ¼ inch thick, with the ends vertical and of the same thickness. In testing the two 36-inch meters, the weir was 8 feet long, which left a distance of 2 feet between each end and the adjacent side of the chamber. The weir for the 20-inch meter was 3 ft. 6 in. long, giving 4 ft. 3 in. from each end to the wall. A piezometer pipe 2 inches in diameter was placed 6¼ feet back from the weir and 6 inches above the floor of the chamber; it was perforated on the top with eighteen $\frac{3}{16}$-inch holes about 6 inches apart, and was connected with the measuring-boxes of the hook and automatic gauges by 24 feet of pipe having six right-angle bends. Readings of the hook gauge were taken every 30 seconds, and these results were used in calculating the discharge over the weir. Each meter was tested with different speeds, ranging from that due to a head on the weir of about 0·3 foot to one of about 0·7 foot. The records of the automatic gauge agree closely with those of the hook gauge.

The results of the experiments are given below—

Meter.	Duration. Min.	Head on Weir. Feet.	Meter.	Weir.	Meter Error. Per Cent.	Velocity in Pipe. Feet.
36-in., A.	60	0·3277	134,170	134,500	0 25+	0·71
,,	60	0·4624	222,650	222,000	0·30−	1·17
,,	60	0·6043	330,940	328,100	0·90−	1·72
,,	60	0·7069	417,960	413,900	1·00−	2·17
36-in., B.	50	0·3452	120,660	121,300	0·50+	0·77
,,	50	0·4787	195,300	196,700	0·70+	1·24
,,	52	0·6147	294,190	296,600	0·80+	1·80
,,	51	0·7036	352,770	355,100	0·70+	2·19
,,	40	0·3940	117,270	117,500	0·20+	0·93
,,	52	0·6889	348,490	349,800	0·40+	2·12
,,	25	0·5670	125,460	125,700	0·20+	1·58
20-in.	50	0·3212	47,240	47,900	1·40+	0·98
,,	50	0·7056	150,090	150,890	0·50+	3·08
,,	50	0 5958	117,070	117,620	0·50+	2·40
,,	50	0·5005	90,570	91,210	0·70+	1·86
,,	30	0·4041	39,670	40,150	1·20+	1·37

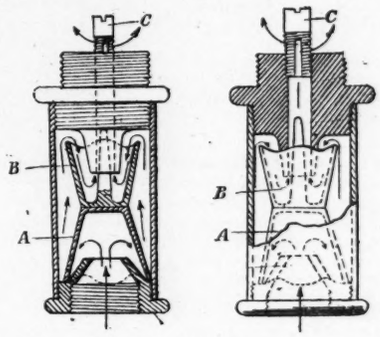
Commercial Production of Oxygen.—A good deal of attention is being given by a popular morning contemporary to the recent discovery by M. Raoul Pictet of a new method of producing oxygen for industrial purposes. It appears that, taking for a starting-point the results obtained by scientists in 1877, conclusively proving that the point of liquefaction of oxygen under atmospheric pressure is −183°, while that of nitrogen under the same conditions is −195°, M. Pictet constructed an ingenious apparatus by means of which he was enabled to gradually extract the nitrogen, leaving the oxygen practically pure. The cost of the operation is stated to be less than "one-tenth of a penny per cubic yard." It is something new to talk about a "cubic yard" of a gas; but we presume this is an innovation by the smart, up-to-date journalist. The discovery will, we are assured, revolutionize the world's trades. By means of "industrial oxygen," the "soldering of large masses of iron and steel will be an easy matter, and riveting will be done away with. The plates of vessels, the beams of bridges, railway lines, &c., may be constructed in future in one piece." As far as our own industry is concerned, we are told that the discovery will lead to a great reduction in the cost of innumerable chemical products; and that water gas will be obtainable at the remarkable price named above—viz., "one-tenth of a penny per cubic yard." The result of this for lighting purposes we are assured will be "tremendous." M. Pictet is reported to predict that "in a few years every town will have its oxygen manufactory, and coal will be superseded by oxygen." It is scarcely necessary to say that the "puff preliminary" of the new process has been followed by the announcement that it has been "taken up by a powerful English Syndicate;" and we learn that "a large factory is being built at Manchester, under the superintendence of Messrs. Galloway, in which it will be possible to produce 5000 cubic yards of industrial oxygen per day." When this is ready, we presume there will be the usual "Press view" of the plant, with the attendant conviviality and the customary results.

REGISTER OF PATENTS.

Regulators for Gas-Burners.—Bohr, J., of Vienna. No. 15,545; Aug. 31, 1900.

The patentee has designed the arrangement shown for the purpose of obviating some (at times) objectionable "phenomena" of incandescent burners, the effects of which are: (1) Changes in illuminating power caused by differences of pressure; (2) a hissing sound; and (3) a blackening of the incandescent body.

The device is composed of a casting divided into three parts. The inlet is preferably smaller in diameter than the outlet. In the casing, a freely moving valve is placed composed of a hollow cone A, made of any light material—such as aluminium—covering the entry. To the cone a central pin is fixed, entering the outlet, and enclosed within an inverted cone B placed on the cone A, and serving to regulate the passage of the gas and limit the movement of the valve. The upper edge of the inverted cone is indented, in order to prevent it from



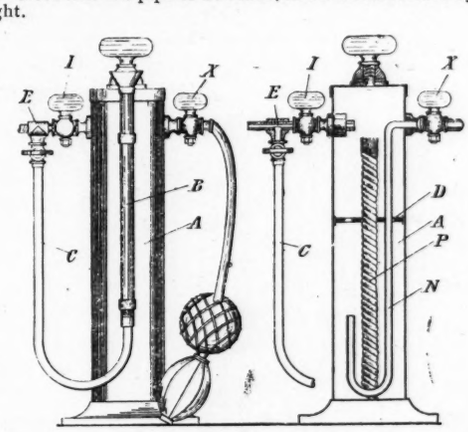
completely stopping the passage of the gas, when the edge is pressed against the cover of the casing. The lower edge of the cone A is also indented.

The valve acts in the following manner: If gas is not passing, the cone A rests on the bottom of the regulator; the central pin allowing the widest passage. When the gas, under normal pressure, enters the regulator, the valve still remains unmoved; and the gas passes through the indents of the lower cone—following the direction of the arrows. When, for any reason, the pressure of the gas increases, the valve is lifted proportionately, and partially closes the outlet, so that (notwithstanding the increase of pressure) the supply to the burner is always the same. When the increase of pressure is maintained, the valve is suspended in the current of the gas. It is therefore necessary that the weight of the valve should be determined exactly according to the normal pressure of the gas. This result is obtained by the indented cone B, which bears against the cover of the casing.

The regulator is also provided with a device by means of which the difference of weight of the valves may be compensated for by regulating the passage of the gas—that is to say, increasing or decreasing the pressure of the current of gas according to the weight of the valve. This regulator is composed of a screw C, slotted for the greater part of its length, screwed into the outlet. By raising or lowering the screw, the outlet-section formed by a part of the slot is increased.

Testing Gas-Pipes.—Kowalsky, P., of Berlin. No. 15,966; Sept. 7, 1900.

The invention consists in combining with a suitable reservoir a pressure-gauge and a small air-pump—the latter preferably in the form of a rubber ball connected to a larger gas-ball of the usual kind. The reservoir is adapted to be connected to the pipe to be tested, and is provided with cocks, so that when filled with compressed air, and connected to the pipe, any leak in it is indicated by the fall of the liquid in the gauge. The location of the leak is determined by vaporizing oil—such as petroleum-ether—in the reservoir, so that the vapour may be forced into the pipe to be tested, and the leak located by means of a light.



As illustrated, the reservoir A is fitted with inlet and outlet cocks at or near the top. The inlet-cock X is connected to an air-pump of the ball type; and inside the reservoir a pipe N is led from the air-inlet down to the bottom—preferably being bent into a U-form and perforated near its end, which is closed so that air can enter and reach a position even near the bottom of the reservoir. A perforated partition D is fixed above the U portion of the pipe, so as to divide the reservoir

into two parts. The object of this partition is to prevent the liquid oil from being forced out of the reservoir when agitated by the air which is passed through the perforated tube to vaporize it; the oil being poured into the reservoir on starting to use the apparatus through a nipple, so as to just cover the U portion of the tube. The outlet-cock is connected to the pipe to be tested by a small pipe or union E, from which another pipe C is led to a pressure-gauge B, consisting of a U-shaped pipe attached to the main reservoir.

When it is desired to use the apparatus to test for a leaky pipe, the outlet-cock union E is connected to the pipe, the outlet-cock I and gauge-cock are opened, the cock X closed, and the air-bag filled with compressed air by the blower. The gauge-glass is then about half filled with water, and the cock X opened until the water in the gauge-glass has risen to about three-quarters of the height. The air-inlet cock X is then closed, and the level of the water in the pressure-gauge noted. If the level remains constant, it will show that the pipe is intact; whereas a fall in the level will indicate a leakage.

When it is desired to locate the position of a leak, oil is poured into the reservoir, which is connected up to the pipe (as before). Only this time, when the air is allowed to pass through it from the air-pump, it vaporizes the oil, and the vapour is forced into the pipe to be tested (the pressure, if desired, being made considerably greater than the normal gas pressure in the piping); the location of the leak being ascertained by means of a light in the usual manner.

In order to assist the vaporization of the oil, a wick P is arranged to pass up from the oil to near the top, and be held there by a wire.

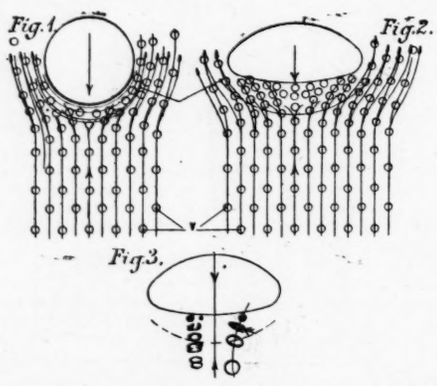
Purification of Lighting and Heating Gas.—Danner, S., and Kubelka, G., of Kladno, Bohemia. No. 5689; March 18, 1901.

According to this invention, complete purification of gas is obtained by driving it with great velocity against a finely-divided cleansing or purifying substance, and so causing it to impinge upon the latter.

In explanation of their proposal, the patentees say: In tower-condensers, condensation takes place on the walls of the apparatus, on the surface of separate particles of dust, or in the form of fine globules (sometimes enclosing dust) similar to the globules of aqueous vapour forming mist or fog. These globules form, in turn, surfaces on which fresh matter may condense; and this causes the globules to collapse and form drops, which become so heavy that they separate from the gas similarly to the particles of dust moistened with condensed matter, at a sufficient decrease in the velocity of the gas. Such gas cleaners are made to large dimensions, in order to facilitate separation. Single dust particles are also separated from the gas by the falling water which comes into contact with the particles and carries them away by adhesion.

The conditions for obtaining success with this kind of cleansing or purifying are: The presence of a large cooling surface for the gas, and large chambers or guiding flues of large cross section, to decrease the velocity of the gas. Thorough purification of the gas is not obtainable in this manner, for the following reasons: A compressed layer of gas is formed on the underside of the falling drop of water, in consequence of the motion of the drop towards the gas; and, further, a current of gas is caused which differs from the original direction of the gas. Fine globules of condensation, and very light particles of dust, which have not become heavy enough by condensation on their surfaces to separate, are carried by the drops of water by adhesion, if they are to be separated from the gas. In order to cause the drops of water to be separated from the gas by adhesion to the water, these particles must (1) withstand the deflected current of gas to a certain extent; (2) penetrate the compressed layer of gas on the underside of the drop of the cleansing agent. If the velocity of the gas towards the cleansing agent be low, the greater part of these fine particles—even if they have sufficient momentum in the direction of impact to permeate the compressed layer of gas—will not get in contact with the drops of the cleansing agent, because the deflection due to the current of gas trying to pass the drop will cause the particles to get out of the line of contact, and the particles will therefore be unable to expend sufficient energy to permeate the layer of gas.

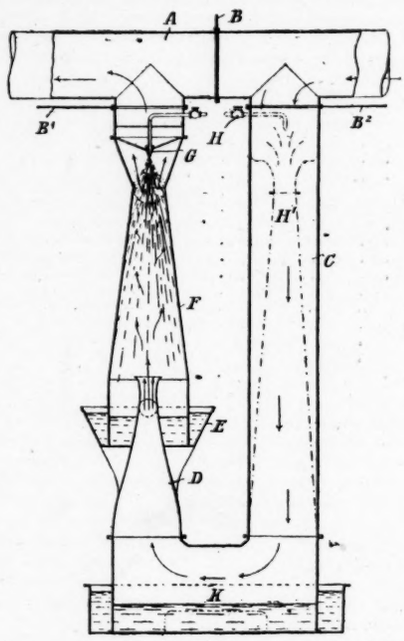
If, now, the velocity of the gas and cleansing agent towards each other be increased beyond a certain limit, the conditions become much more favourable. The drop assumes a more oval form; and though the compression on the underside increases approximately in the same proportion as the momentum of the impinging light foreign particles, more of the latter are separated than when the velocity is less, for the following reasons: (1) In consequence of the increase of the surfaces of



impact, more foreign particles will impinge on the cleansing agent. (2) In consequence of the stronger formation of eddies on the increased surface of impact, more foreign particles will flow together, whereby the weight is increased and their separation facilitated. (3) Though the absolute amount of the deflection of the current of gas on approaching the drop of cleansing agent is increased, consequent on the increase of the velocity, the deflection of foreign particles proportionately to the energy in the direction of impact is decreased—*i.e.*, fewer particles are deflected. Further, the foreign particles will be grouped much closer together on the underside of the drop than in the case of less velocity; and their density will be greater than in the other part of the chamber, because their movement is delayed by the dense layer of gas, and thus more particles follow and accumulate. The deflected current of gas will leave behind more impurities contained in it than in the case of a smaller velocity; therefore, the union of the foreign particles among themselves, and consequently their union with the cleansing agent, is facilitated. (4) In consequence of the increase of the force of the impact by the increase of the velocity, fine globules of condensation become compressed already when impinging with the compressed gas on the underside of the drop of the cleansing agent, and thus collapse into the form of a small drop. The decrease of volume resulting therefrom decreases the resistance of the compressed gas to the condensed matter, which thus comes in contact with the cleansing agent and is separated from the gas by adhesion to the cleansing agent. (5) If the increase of the velocity of the gas towards the cleansing agent is sufficient, many drops of the latter will be deformed (as shown in figs. 1, 2, and 3), whereby deflection is still further decreased—such deformation proceeding to the formation of a sack by drops which have a tendency to divide or split up.

Fig. 1 illustrates a drop of the cleansing agent, against which the gas impinges with comparatively low velocity. The paths indicated by arrows are those of the gas; the paths not marked by arrows are those of the impurities. This figure shows that the impurities are deflected close to the surface of the drop on which the gas impinges. The impurities, therefore, cannot come into contact with the cleansing agent, and are not separated from the gas. Fig. 2 illustrates the increased surface of impact of a drop of the cleansing fluid caused by the increase of velocity of the gas; the drop having been deformed in consequence of such increase of velocity and greater impact, whereby less deflection and a denser disposition of the impurities is caused than in fig. 1. Fig. 3 illustrates the formation of small drops from condensed globules by impact and pressure.

The proposed new process for the cleansing and purification of gas is based upon the principle of increasing the relative velocity of the gas towards the cleansing agent beyond a certain minimum limit, and the consequent positive throwing out of the impurities; and the process "is rendered still more valuable by the decrease of the area of the cross section of the chambers or channels, and therefore the denser distribution of an equal amount of cleansing agent."



A vertical section is given through apparatus suitable for carrying out the invention. A is a pipe from which the gas passes into a pipe C, when the valve B is closed and the valve B¹ is open. The passage of the gas at or about its normal pressure is accelerated by a blower H, and narrowed pipe H¹ belonging thereto, so that the gas issues from the pipe D and enters the pipe F with great velocity. Here it impinges on the cleansing agent, which enters in a finely divided condition, and with great velocity, from the nozzle G. In consequence of the strong impact thus produced, and the great friction of both substances, all impurities—such as tar—contained in the gas are separated. By the continual tapering of the tube F, the process is repeated to a certain extent, so that when the valve B² is open, gas of great purity enters the service-pipe. The condensed matter which contains the impurities accumulates in a vessel E, which connects the pipes F D with each other, and also in the bottom receptacle K.

At the Bolton Borough Police Court recently, Joseph Dawson, a hawker, was charged with stealing a gas-meter, the property of the Corporation. The prisoner took the meter, which was worth £2 2s. 6d. from a house, and sold it to a broker named Boyes, who gave him 5s. for it for scrap. Dawson was fined 10s. and cost, or seven days; and Boyes was cautioned.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

An Invitation from the American Gaslight Association.

SIR,—I shall be obliged if you will insert in your next issue the enclosed copy of a letter containing an invitation from the American Gaslight Association, which will, I am sure, be greatly appreciated. Members of the Institute who may be able to accept this invitation are requested to communicate with me as soon as possible.

39, *Victoria Street, S.W.*,
Aug. 29, 1901.

WALTER T. DUNN,
Secretary, The Incorporated Gas Institute.

[ENCLOSURE.]

AMERICAN GASLIGHT ASSOCIATION,
58, *William Street*,
New York City, Aug. 2, 1901.

Mr. Walter T. Dunn, Secretary, The Incorporated Gas Institute,
39, Victoria Street, Westminster, S.W., England.

Dear Sir,—As Secretary of the American Gaslight Association, I wish to extend through you to the members of the Incorporated Gas Institute a cordial invitation to attend the meeting of our Association, which is to be held in Boston (Mass.), Oct. 16, 17, and 18. As Boston is on the Atlantic coast, it is very convenient of access from England, and it is also somewhat interesting to the gas man at present on account of the installation of coke-ovens at Everett, from which illuminating gas is being supplied to the Gas Companies of Boston and its vicinity.

We will endeavour to make the stay of any of your members who may attend the meeting a pleasant one; and if I am notified beforehand of their intention to come, I will look out accommodation for them during the meeting.

(Signed) ALFRED E. FORSTALL, Secretary.

Profit Sharing for the Commercial Company's Workmen.

SIR,—I do not suppose a soul among your readers will believe for a moment the suggestion of "boycotting" referred to in "Chairman's" letter in the last number of the "JOURNAL;" but, as silence might be misunderstood, I write to say that not only is such a thing impossible, but any pressure would be most undesirable. Unless the scheme be freely and spontaneously accepted with an independent and manly spirit of interested sympathy with the success of the industry in which we all work in common, it would be worse than useless—indeed, it would be positively mischievous. I am glad to find that there is the right spirit throughout the whole of my fellow workers and friends of all branches in the service.

Commercial Gas Company, Stepney,
Aug. 31, 1901.

HY. E. JONES.

Auditing of Gas Companies' Accounts.

SIR,—The article of Mr. F. G. Newton, which you publish in your issue of Aug. 20, appeals to me as being a very clear exposition of thoroughness.

Mr. Newton, however, appears to have a most comprehensive idea of an auditor's duties so far as gas companies are concerned; but should not some of the responsibility he thinks the auditor ought to take be put on the shoulders of the secretary or manager? It seems to me that if the auditor is to know so much about a gas-works, he would have to serve two or three years on a works; and then I question if his knowledge and ability to audit the accounts would be equal to the task Mr. Newton would set him.

Surely the manager of a works must have some responsibility for the correctness of the various books, &c.; and if his books are made up in accordance with a pre-arranged system—a system by which no man is relied on alone for any special figure—there would be very little opportunity left for individuals to tamper with entries.

I am of opinion that it is the loose manner in which books and entries are dealt with in some offices that requires remedying. No amount of auditing can do away with the necessity for a proper system, based on sound business principles throughout.

Many offices are under-manned (for the sake of supposed economy), and defalcations take place—some of which we hear of.

If every man who received cash had nothing to do with crediting it in the ledgers, and the balances were kept more under the manager's eyes, there would be less to complain of.

According to Mr. Newton, the auditor must be the man to control the works and, of course, draw a corresponding salary. Would not the case be met if auditors remained in their present positions, and engineers and managers took more interest in the commercial or accountant's side of their undertakings? If the manager is really interested in his accountant's department, no auditor should be able to teach him how to do his work or find this department tripping.

Nuneaton, Aug. 28, 1901.

GEO. HELPS.

Dry v. Wet Meters.

SIR,—On reading your report of my remarks in the discussion of Mr. Langland's paper at the recent meeting of the Irish Association of Gas Managers, I find that what I said about dry meters is not—probably through my own fault—correctly reported. In what I did say, I strongly advocated the use of dry meters, especially from a consumer's point of view, while admitting that the wet meter, taking for granted such careful inspection and attention as is seldom attained in practice, is a more reliable measuring apparatus. Permit me to add that so impressed am I with the many objections to wet meters, such as jumping lights and sudden extinction, that I have not for many years ordered one. May I also add that what I said about mantles, in the same discussion, is not, as reported, quite what I stated; but that is a small matter.

Wexford, Aug. 28, 1901.

JOHN LYNE.

Patent Scandal.

SIR,—The unsparing exposure of the present position of the 1893 Welsbach "patent" and its seeming worthlessness, and the apparent deliberate and un-English policy of the Welsbach Company in threatening and attacking the sellers and users of incandescent mantles who cannot defend themselves, and in refraining from taking action against the makers of these same mantles who can do so, as described in the "JOURNAL" last Tuesday, ought surely to be sufficient to lead to the beginning of the end of the present injustice and oppression practised in the name of the law, and to the undoubted detriment of the lighting industry in this country.

It has been suggested that "the Attorney-General be immediately requisitioned to deal, or to cause to be dealt, with, once and for all, the question of the validity of the 1893 Welsbach patent." The Attorney-General is the Law Officer of the Patent Office, and in a case like the present it is his duty to protect the rights of the public. Anyone affected may, in the public interest, with the consent of the Attorney-General, take action for the revocation of a patent; and although, in a case like the present (as set forth in your columns), there need be no doubt as to the ultimate result, still it ought not to be left to private firms or individuals to face this expense, seeing that the Law Officer is so handsomely remunerated out of the public purse for having abuses of like nature put an end to.

Under any circumstances, "priority of publication," as you put it, invalidates a patent, and, as your columns show, the publication of the solitary claim in the 1893 Welsbach patent—seemingly with the consent of the Welsbach Directors—took place almost two years before the said patent was applied for, which makes the case more aggravated than ever.

I have had occasion before this to publicly point out what a mere farce the patent system is in this country; and there surely could be no more striking instance than the one in question of the absolute inequity and absurdity of the system which permits such a state of matters to exist, far less continue, to the injury of the public.

One thing which strikes the casual observer in the story told in your pages is, if the Directors of the Welsbach Company and their King's Counsel and other advisers knew or know the facts of the case to be as stated, and yet persist in prosecuting, penalizing, and ultimately committing to prison so-called infringers (some of whom, as you put it, are quite innocent of wrong-doing), it might be a fair question to ask whether no legal, if not criminal, action can be taken against these Directors and legal advisers for their seemingly extraordinary procedure.

How, again, any Judge of the High Court could take upon himself the responsibility of granting a certificate of validity for the 1893 Welsbach patent in the first trifling and undefended case that was ever brought before the Courts under that patent, without having the slightest evidence brought before him apparently to prove either its novelty or its validity, almost passes ordinary comprehension. The Welsbach Company have ever since (in their bills and advertisements threatening all and sundry) made the most of this certificate of validity; and, as is stated in the "JOURNAL," they now boast that they have obtained no less than 800 injunctions within about the past six months, principally against the customers of their opponents, the other makers of mantles whom the Welsbach Company are evidently afraid to attack openly. As no such scandal could possibly take place in (say) the United States and Germany—where the 1893 patent does not exist, where, as your article states, there is prior examination, and where patents are only granted and upheld on their merits—the full responsibility for the present disgraceful state of matters must fall on the British patent system. The present Colonial Secretary, again, is mainly responsible for the patent system now in force in this country; and it will be interesting to know, when the 1893 Welsbach patent has been officially declared to be invalid (as, in my opinion, must occur sooner or later, if justice is to prevail), whether the right honourable gentleman's former doctrine of "Ransom" will apply in the settlement with those unfortunate victims against whom the 800 injunctions have been obtained, and who have already been respectively fined, penalized, or imprisoned under this iniquitous system.

Is it not also about time that the Government appointed at least one Judge, having the necessary training, ability, and technical skill, to deal solely with patent cases, as is so satisfactorily done elsewhere? As regards the particular case in question, matters cannot now scarcely remain where they are, as it appears to be obvious, in connection with the Welsbach 1893 patent and its monopoly, that it may be upset by anyone who cares to incur the cost and trouble of prosecuting an action.

Meanwhile, it is for the trade journals and the Press to enlighten public opinion on this latter phase in the working of our unsatisfactory patent laws and the results therefrom.

London, Aug. 31, 1901.

JAMES KEITH, Assoc.M.Inst.C.E.

Wentwood Water Scheme of the Newport Corporation.—The Water Committee of the Newport (Mon) County Council have received a report from Mr. Baldwin Latham, their Consulting Engineer, as to the probable cost of the Wentwood water scheme. His estimate gives £400,000 as the probable total cost. Already £260,000 has been expended, and the work will not be completed in less than about two years. The reservoir will contain 400 million gallons.

Nottingham Water Supply.—During the year ended the 25th of March last, the Water Committee of the Nottingham Corporation carried on the undertaking at a profit. In their report they state that the revenue was £2857 more, and the expenditure £9437 more, than in the previous twelve months. After paying the annuities and interest on loans and consolidated stock, and the annual contributions to the different sinking funds, the ultimate balance of profit amounts to £2226, which the Committee have carried forward to the account established to provide for depreciation, renewals, compensation to workmen, and other purposes. On the 25th of March there were 65,097 houses served; all other supplies numbered 39,874—making a total of 104,971. The estimated population is 292,936. The water-rent receipts totalled up to £83,704, exclusive of the quarter's water-rents accrued due at Lady-day; and the total revenue was £85,815. Working expenses came to £31,810.

MISCELLANEOUS NEWS.

MUNICIPAL OWNERSHIP OF PUBLIC UTILITIES.

This is the title given to an article appearing in the "Municipal Journal and Engineer"—an American publication that has several times been referred to in our pages. The author—Mr. Walter S. Allen, of New Bedford, Mass., formerly Secretary to the Massachusetts Gas Commission—forwards advance slips of his contribution, from which we take the following extracts.

In the current discussion on the municipal ownership of gas-works, electric light plants, and street railways, the advocates of this idea assert positively that the public management of these needs in a modern community will result in reduced cost of service to the users and profits to the municipality, which will reduce the burden of taxation on all the citizens; while those who consider that there may be some question as to the probable advantages to accrue to the community are looked upon as enemies to the common welfare, and tools of the corporation. It is my intention here to consider these two propositions from the standpoint of one who believes that better service at lower rates can be obtained from private companies properly controlled by public authority, and to point out the principles which ought to govern the methods of control.

A little consideration of the two claims made in favour of the public ownership of public utilities will show that these reasons are by the very nature of things antagonistic to one another; that if the price of service be reduced to its lowest possible limit—that is, to cost—there will be no profits to relieve taxes, or if profits are secured these must be paid by the users, and the price of the service must remain at a high level.

Let us suppose, for the sake of argument, that prices for service are maintained at a level which will return a net profit to the city, after charging all depreciation on the plant and interest on the loans, and consider from whom this profit comes and who benefits by it. The municipality receives a return which it may apply to general purposes; and the city, by this amount, is so much better off. But who contributes this? It is plain that profits must come from the pockets of consumers of light or users of street railways; and thus the profits of the municipal operation of these public utilities becomes a special form of taxation laid upon the users. They must pay an increased price for light or for street transportation, in order to reduce the taxes of those who are unable to avail themselves of these services, or who have no opportunity to do so. In other words, taxes, instead of being equal and proportional, or even based on ability to pay, are assessed according to the use made of these modern improvements; and since those who do so use them make up a very small part of the community, and are also in many instances those who can least well afford to pay, a charge for service in excess of actual cost causes them to bear an unjust proportion of the expenses of the administration of the municipality.

For the sake of illustration, let us take the not improbable case where there are but ten private users of electric light from a municipal plant in a community of 10,000 inhabitants, and the price charged to these ten users for lighting their stores and houses is sufficiently high to pay all the expenses of operation. If the city uses for lighting its streets 50 arc lamps, the city will then get its street lighting free of cost. But the ten users of electric light pay for all the street lighting for the community; and the high charge laid on them becomes a special tax for the benefit of the remainder of the inhabitants.

The results obtained in cities in Great Britain and Germany under municipal management are freely quoted by the supporters of the plan for extending the functions of municipalities; but these advocates fail to state that in all these cities a charge is made by the gas or electric light department for all the street lighting, and that taxes and water, and work done by any other department of the city, are charged up to the gas and electric light departments in the same way as they would be charged to a private company. Moreover—and this is important—they omit to call attention to the fact that in those cities where profits (in the most part made by charging full commercial prices for street lighting) are used to reduce taxes, the price for service to private users is higher than in those places where profits are applied to the reduction of the price to consumers.

We hear a great deal about the low price of gas and electric light in Glasgow, and about the large profits made by the Municipality in Manchester and Birmingham; but we do not have shown to us that the price of service in Glasgow is such that the profits of the gas business last year were £33 and the electric light profits £39, while the price of gas and electric light in Manchester was higher than in Glasgow, although the conditions in the latter place are such that the prices ought to be considerably lower.

A great deal is written about the low price of gas in Birmingham, Manchester, and Glasgow—Municipalities supplying their own gas; but nothing is said of the price in Sheffield, Newcastle, and Plymouth, supplied by Companies working under conditions similar to those in the former cities. All these furnish gas at lower rates, and give as good or better service. It is invariably the rule that companies introduce modern improvements far more rapidly than do municipalities. This is proper; for managers have no right to risk public funds in schemes of uncertain value.

Much stress has been laid on the application of the profits from municipal management of public utilities to reduce the general rate of taxation. Does anyone seriously believe that if such profits were really made, the general taxpayer would learn of the fact from his tax-bills? Our city councils can always find opportunities to spend money; and they would look on these profits as so much more income in addition to the amount received from taxes. It may even be questionable whether a municipality has a right, under the State Constitutions, to charge such prices for service as will return a profit; for this profit would be a special tax laid upon a small portion of the community for the benefit of the others, and would not be equal and proportional. No Court has as yet passed upon this question.

If the price of service is to be reduced, the cost of production, which must include taxes and interest on the cost of the plant, must be lowered. Is it possible that anybody who has ever had any experience with general municipal methods believes that municipalities can do work more cheaply than companies?

The chief advantage which a city has over a company lies in its ability to borrow money at a lower rate of interest than a company, because the security for the loan consists of the whole property of every individual in the community. But this advantage is not as great as may seem. If we analyze the accounts of any public service company, we shall find that this saving will amount to between 5 and 10 per cent. of the income—an amount easily offset by the enhanced cost of municipal methods of work. I am sure no one who sees city workmen at work on the streets, and compares them with workmen doing similar work for a street-railway company, can fail to see that the latter accomplish far more in a given time.

Statements are freely made concerning the success of municipal plants in Europe; and on these assertions are based the claim that similar results may be obtained in this country. But there are great and fundamental differences between municipal government in the United States and Europe. If a European city desires a manager for some municipal plant, it advertises for such a man, and hunts all over the country until one is found, who, by his ability, is considered fit to hold the position, and neither residence, personal relations, nor political "pull," plays any part in the choice. This highly developed non-political civil service extends also to the subordinates and workmen. In Germany the desire for highly-trained civil servants goes even further. The cities there advertise for a mayor when the position becomes vacant; and as the usual term of office of these officials is twelve years, the cities secure trained ability, which contrasts very strongly with the usual American officials.

In the same way there is a great difference in the composition of the city councils in Europe. In England, the restrictions on municipal suffrage, and the inclusion of women taxpayers as municipal voters, make the councils far more representative of the taxpayers than in this country; and in Germany the restrictions are still greater. There, a group of taxpayers, each of whom pays more than a certain sum in taxes, chooses one-third of the council; a group paying between certain fixed limits chooses another third; and the rest of the people choose the remainder. In Berlin, for instance, there are about 4000 voters of the first class, 8000 of the second, and 120,000 of the third; and each of these classes elects one-third of the council.

What the people desire from these public servants is good service at a low cost; and the cry for municipal ownership fostered by one or another interest has induced the belief that only in this way is it possible to secure these. But there may be other ways which will yield better results. The true method of reducing the price of public services to the user is not by increasing the work of the municipalities, but by the regulation, on equitable principles, of the price of service supplied by companies. Let private enterprise risk the money necessary for the introduction of new methods and allow it a fair return on the capital invested; require it to keep its books of account according to methods prescribed by the State or the city; have these books open to the inspection of public officers; allow no issues of stock or bonds for any other purpose than the extension of the plant; prohibit the making of these extensions from profits; and arrange that economies due to improvements in methods and ability of management be divided between the users and those who have invested their money in the development of the business.

Most of the profits made by the companies are due to good management; and while a portion belongs to the community as a return for the right to use the streets, another part rightfully belongs to the company as compensation for ability of management. By this division there will always be an inducement to increase the service and to cheapen it to the users, because from greater use there will come greater profits to the Company.

Under the conditions enumerated above, we can secure fair treatment to those who put their money into these plants at considerable risk, and at the same time secure to the users low rates for service. The public will obtain its light or street-car service at a lower price than is possible from a municipal plant; the evils always present when a city undertakes a commercial enterprise will be reduced to a minimum; and it will be impossible for a company to maintain excessive prices for service.

The extent to which municipalities have already gone in the way of bonding the taxpayers of this and future generations for public works of all kinds, is beginning to excite apprehension in the minds of careful and conservative observers; but with true American disregard of the future, such criticisms do not receive any attention from the mass of our citizens. We are content to live in the present; and those who suggest that our cities should be financiered in a conservative way, are attacked as old fogies, and told that progressive communities must have all the modern improvements, and that future generations may safely be left to devise means for paying off the debts incurred by this generation for public improvements.

IMPROVEMENTS AT THE SOUTHPORT GAS-WORKS.

Inauguration of New Retort-Stoking Machinery.

Among the many improvements recently carried out at the Southport Corporation Gas-Works, none perhaps are likely to have a more pronounced effect on the carbonizing returns than the retort charging and drawing machinery just started—under the supervision of Mr. John Booth, the Engineer—by West's Gas Improvement Company, of Manchester. The inauguration ceremony took place last Tuesday; and it afforded Mr. John West an opportunity of giving the following description of the general arrangement of the plant.

On each side of the retort-house there are a coal breaker and a powerful cannel breaker, each driven by a separate steam-engine, and all fixed in pits covered over by chequered-iron plates, so that the mouths of the breakers are level with the ground-line of the coal-

store. The coal-stores are on both sides of the retort-house, and coal is brought into them by a railway on the ground-level, and delivered direct into the breakers. After the coal has been reduced to a size most suitable for charging the retorts, it is raised by an elevator from each breaker into a large coal-hopper, capable of holding 10 tons of coal, and fixed overhead on girders supported by the main roof-columns. These hoppers (four in number) are provided with outlets and doors for filling the charging machines as they pass under for the supply of coal.

On each side of the retort-stack there are a charging machine and a drawing machine. The charging machine is fitted with propelling gear, for travelling along the retort-house on lines laid parallel with the retort-stacks. Each machine carries a supply of coal in an adjustable hopper, supported by chains from the top of the frame; and the hopper can be raised or lowered, to suit the various tiers of retorts, by means of gearing worked by the motor that propels the machine. The hopper on each machine—for carrying the supply of coal for the charger—is provided with a feeder-box controlled by a hand-wheel for regulating the amount of the charge. The charger, which enters the retorts with the coal, is carried in a frame suspended below the hopper, and is driven in and out of the retort by a compressed-air cylinder, rack and pinion chain drums, and chains. The drawing machine is fitted with a motor and travelling gear; also gear for hoisting and lowering the rake bar to the several tiers of retorts. The machine is fitted with an automatic controlling arrangement for the air cylinder; and the rake head is driven into and out of the retort by means of chains connected to a rack and pinion worked by the air cylinder, under the control of the attendant. A tank, containing water, is carried on each machine for the purpose of cooling the rake head.

Both charging and drawing machine are worked by compressed air, supplied by an air compressor fixed in a building outside the retort-house. The type of compressor is that known as the "single line," in which the air-cylinders are tandem with the steam-cylinder. The steam-cylinder is steam jacketed and lagged; and all bearings are of extra proportions to minimize wear and tear and repairs under the conditions of running day and night. The air-cylinders are of two sizes, and do the work of compression in two stages. Between the stages there is a cooler to take out the heat developed by the compression in the low-pressure cylinder. In addition to these, each cylinder is provided with a jacket supplied with water for cooling. The suction and delivery valves have a positive action, controlled by cams on a revolving shaft, so that the valves may have large areas and wide openings to prevent wire-drawing and friction of the air, and yet be well under control to prevent detrimental shocks. The compressor is fitted with an automatic arrangement for reducing the speed of the engine when the compressed air in the receiver has attained its maximum working pressure, and re-starting the engine at its full speed as soon as the pressure falls. After the air is compressed, it is delivered into, and stored in, a cylindrical receiver, to which are attached the pipes leading to the retort-house.

The air is conveyed from the receiver by iron pipes to the hose drums, fitted to the girders carrying the overhead coal-hoppers for supplying the charging machines with coal. There is a large hose drum complete with all fittings for each of the charging and drawing machines. A long length of flexible hose is attached to each of the drums at one end, and at the other end to the machine, which is supplied from it. Each drum is provided with a hollow shaft, through which the air is supplied; and by an arrangement of gun-metal swivel-joints the air is supplied to the hose on the drums while they revolve. On each of the hose drum shafts a chain drum in keyed; and a chain attached to it leads over pulleys fixed in the retort-house roof, having weights at the other end, which rise and fall as the hose is automatically paid out and in by the machines. The hose leading from the drums to the machines is supported at intervals by suspending brackets and rollers, so that the strain on the hose is very slight, and the whole arrangement is so automatic that it requires little or no attention on the part of the attendant.

A large party of townspeople and gas engineers from neighbouring places had been invited to witness the starting of the plant. The Mayoress (Mrs. Isherwood), with a golden key, opened the door of the compressed-air engine-house; and, the guests having assembled inside, Mr. West explained the various parts and functions of the engine. Afterwards the party reassembled round the platform, when Alderman Dimond moved a vote of thanks to the Mayoress for the part she had played on so interesting an occasion as this addition to the machinery of the Gas Estate. The Mayor responded.

On the conclusion of the speech-making, the charging and drawing machines were driven along the rails to the other end of the retort-house, where a bench of retorts ready for re-charging with coal was practised upon; and all present were much struck with the ingenuity and efficiency of the machinery. At the close of this portion of the function, the party drove to the Prince of Wales Hotel to lunch, on the invitation of Mr. West.

NOTTINGHAM CORPORATION GAS SUPPLY.

A Successful Year's Working.

At the Meeting of the Nottingham Corporation yesterday, the Gas Committee presented their report on the past year's work in connection with the undertaking. The net profit was £27,123. The City Council had directed that £27,000 of this amount should be paid over to the Finance Committee in relief of the expenditure for the year; and the Gas Committee proposed to carry the balance to the annuity redemption fund. In his report to the Committee, the Gas Engineer (Mr. W. R. Chester) stated that the enlargement of the plant at the Basford works rendered necessary by the great increase in the output of gas for the year 1900, had been continued during the year. Two new exhausters, each of 100,000 cubic feet per hour capacity, had been substituted for two of half this size; and two new steam-boilers had been put down. Four new purifiers are in process of erection, which replace with increased capacity six old ones. The new purifiers will have a total area of 4400 feet, in lieu of 1536 feet provided by the old vessels. Three of these are being re-erected at the chemical works; and the others are being utilized in connection with the experimental works at Basford. In addition to these works, the third section of retorts in No. 3 house is being pushed forward and equipped with the necessary machinery for mechanical stoking and the manipulation of coke. At the chemical works, a new steam-boiler has been put down, and a new solid lead saturator erected in connection with the sulphate of ammonia plant. During the year, very extensive alterations were made to the mains and services along the routes of the new electric tramways. Existing mains which lay under or encroached upon the space to be occupied by the new tram roads were taken up and relaid, either in the footpaths or at the sides of the roads as near as possible to them. On certain routes the mains have been duplicated, and there is now one main on each side of the road. This will be a great advantage both to the tramway and the Gas Department in the future, since there will be no crossing of the streets with service-pipes, and no disturbance to the traffic when additional connections or alterations to existing pipes have to be made. The total mileage of gas-mains is 323·25, there having been 16·42 miles added to the canalization during the year. The number of meters fixed to March 31 last (including 378 lamp meters) was 48,624; being an increase of 2073 meters on the previous year. Of these, 45,931 belong to the Gas Department, and 2693 to the consumers. The demand continues for prepayment meters. At the end of the financial year, 10,563 of these meters were in operation—an increase of 2529 on the previous year. The orders and calls for attention of various kinds from consumers during the year numbered 39,847, against 40,166 before. There were 2264 new gas-services laid, against 2047 in the previous year. The application of gas for trade and domestic purposes, other than for lighting, continues to increase. There are at present in use: Gas cooking-stoves, about 10,629; gas-fires, about 8237; gas-engines, about 478; besides a very large quantity of other appliances of almost every description, which have not been numbered. Of the 10,629 cookers in use, 6388 are rented from the Gas Department and 3895 are supplied, with automatic meters, rent free.

WOKING WATER AND GAS COMPANY.

The Half-Yearly Meeting of this Company was held at Nos. 5 and 6, Great Winchester Street, E.C., on Tuesday last—Mr. CHARLES HORSLEY, J.P., in the chair.

The SECRETARY (Mr. B. Dennett Holroyd) having read the notice convening the meeting, the report and accounts (which were noticed in the "JOURNAL" for the 20th ult., p. 461), were taken as read.

The CHAIRMAN, in moving their adoption, said that the Directors had recently visited the new works at Laleham, and were very well pleased with them. The site was a most suitable one; and there was more land available which they could take if necessary. Of course, this land was under water at times; but the works had been so arranged that they could not be flooded. When finished, the works would be as valuable to the Company as the Staines scheme would be to the Water Companies of London. In two or three months the work now in progress would be completed, and the mains laid to their destination; but the principal part (the provision of storage) had yet to be undertaken. Before the next meeting, the Board would probably have entered into a contract for the construction of two settling reservoirs, each of a capacity of 1,500,000 gallons. The Company had already acquired 11 acres of land at Laleham; and they had powers under their Act to take 8 acres more, if needed. The capital expenditure during the half year amounted to £19,567, and included payments on account of new engines and boilers, and works in course of erection on the River Thames, as well as a considerable portion of the trunk main thence to the Company's district. It also included the Engineers' fees, and the balance of the law costs in connection with the purchase of land at Laleham for the works referred to. The revenue for the six months was £4929, as compared with £4496 for the corresponding period of last year; being an increase of £433. The expenses of maintenance were £1455, as against £1136, or an increase of £319, which was principally due to the increase in the price of coal, wages, repairs to mains, and rates and taxes. The profit for the half year amounted to £2808, as compared with £2232 for the corresponding period of the previous year, or an increase of £576. Adding to the profits the balance brought forward from the previous half year—£592—and deducting interest £379 and income-tax £126, there remained a balance of £2895. It was proposed to pay a dividend at the rate of 4½ per cent. per annum, less income-tax, which would absorb £2203, and leave £692 to be carried forward. The quantity of water pumped during the half year was 74 million gallons, as against 66½ million gallons in the same period of last year. In consequence, however, of the increased price of fuel, &c., it had cost them ¾d. per 1000 gallons more for pumping. During the six months 2254 yards of new mains had been laid, and 118 fresh services connected. He was pleased to say that this year the Company, in spite of the dry weather, had not had to curtail the supply of water to the consumers.

Mr. R. HESKETH JONES, J.P., in seconding the motion, said it must be a great gratification to the shareholders to know that, notwithstanding the large increase of capital necessary to carry out the works now in progress, the profits of the past half year had been more than sufficient to pay the proposed dividend.

Mr. C. E. JONES said he thought both the district of Woking and the shareholders were indebted to the Board for what they had done. They were certainly passing through a time of anxiety to the Directors in calling up fresh capital and expending it; but he believed they might rest assured that there would be a corresponding increase in the revenue, and that the dividend would be maintained.

A dividend at the rate of 4½ per cent. per annum, less tax, was then declared; and the proceedings closed with a vote of thanks to the Chairman and Directors.

The late Mr. Robert Holliday, of Ravensknowle Hall, Huddersfield, Managing-Director of Read Holliday and Sons, Limited, chemical manufacturers, left property valued at £20,282.

SINGAPORE GAS COMPANY, LIMITED.

An Extraordinary General Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C., to pass resolutions for the winding up of the undertaking; the chair being occupied by Mr. SAMUEL SPENCER. It was explained that, in deference to the views expressed by some of the shareholders, the Directors had arranged to modify some of the figures mentioned in the print of the resolutions sent to the proprietors.

The SECRETARY (Mr. R. M. Christie) having read the notice convening the meeting,

The CHAIRMAN moved the adoption of the first resolution—that the Company be wound up voluntarily, and that he and the Secretary be appointed Liquidators, at a fee of 300 guineas. He said that at the meeting in May the Directors promised to call the shareholders together at the earliest date possible, for carrying into effect what was then sanctioned. The Board had not lost a day in fulfilling this pledge. The Directors had sent out proxies, and Mr. Robbins had done the same. The result had been that the Board had received 4423 proxies from 79 shareholders in favour of the resolutions, and 4118 from 30 shareholders against them. It would thus be seen that the majority of the shareholders were in agreement with the resolutions; but he only voiced the wish of the Board in saying that it was hoped they would come to a unanimous decision. At the Board meeting held to consider the resolutions to be put before the meeting, the Solicitor was present to advise; and it was agreed that the Secretary and himself should be put forward as Liquidators, as it was thought they could give the necessary time and knowledge to bring about an early settlement. He believed they would all agree with the second resolution. With regard to the third, there were some shareholders who thought that the amount proposed to be paid to the Secretary was excessive; and the Board had therefore decided to alter this to £300. In arriving at the amount recommended for the Secretary, they took into account his lengthened service; and considering that it would take six or eight months to close up the business, it was practically giving him a bonus of about half, as he would have to keep up the books in the usual way. Mr. Page had been with the Company over twenty years, and had been a most faithful servant; and during the last three troublesome years, although entitled to a holiday, he had remained at his post. The Board regretted that they could not allow him a larger sum, as he was not remaining with the Municipality. As regarded Mr. Ford, the Directors were fully conscious of the zeal and tact he had displayed in arranging everything the other side with the Municipality. At their request he had undertaken to remain out there until the completion of the transfer, though his time was up last year. As to the fourth resolution the sum suggested was a small honorarium to the Directors; and it really meant about £50 each, as one-third of the sum named would be due to them for fees before the resolutions were confirmed. But as some exception had been taken to the amount being voted, the Directors would be agreeable to leave the matter to the shareholders to decide. He had gone into the question of the resolutions at some length, in order that those present might have a full view of the matter; and after what he had said, he did not think anyone could consider the amounts proposed were preposterous. They had made a very good bargain. The Municipality first offered them £20,000; and then £30,000, and threatened to build new works if they did not accept it. The shareholders, however, agreed to accept not less than £40,000; and the Municipality had given £41,420, or £1420 more than the Company hoped to get. This extra sum, he ventured to think, would cover all expenses of gratuities and liquidation. In leaving this point he would like to add that Mr. Ford was invaluable to them in obtaining the sum they had. If the resolutions then submitted were carried, they would have to be confirmed; and in accordance with the agreement, the money would be paid four days after the papers were exchanged in Singapore, and the amount cabled over. So that by the end of October the Liquidators would be in a position to arrange for the repayment of the debentures, and also to pay the proprietors about 40s. per share—leaving the balance to be dealt with as soon as the amount for the stocks, &c., was received. The Engineer thought the outstanding debts would take three or four months to collect.

Mr. W. T. BATTEN seconded the motion.

Mr. ROBBINS said he was sorry to find himself in antagonism to the Directors. During the ten or twelve years he had been connected with the Company, they had had many downs and but few ups; and he thought that if ever there was need for a quiet burial, the Singapore Company were entitled to it. The Chairman had made a great deal of the good terms they had secured; but it must be remembered that £40,000 was the minimum, and that the Directors were to get the best sum they could for the shareholders. He thought that one Liquidator would be sufficient, and also that the fee proposed to be paid was too high.

The CHAIRMAN said the misfortunes of the Company had been caused by the depreciation in silver, which the Board could not control.

The resolution was, after some further discussion, carried, with two dissentients.

The CHAIRMAN next proposed, and Mr. R. GARRAWAY RICE seconded, that the conditional agreement between the Company and the Municipality be confirmed; and this was agreed to.

The CHAIRMAN then moved the third resolution—that the Liquidators be authorized to pay the Secretary £300, the Accountant (Mr. T. Page) £150, and the Engineer (Mr. Ford) £200, on their relinquishing their posts under the Company.

A long discussion ensued, in the course of which it was suggested by Mr. H. W. SMITH that the amount to be paid to Mr. Page should be fixed at £200; and with this alteration the motion was put and carried unanimously.

Mr. SMITH moved the adoption of the fourth resolution—that the sum of 400 guineas be allowed to the Directors for their services as from the annual meeting held in May last. He was sure that if the Chairman had not used the influence he possessed, the shareholders would not have received the price they had for the undertaking.

Mr. ALDERSON having seconded the proposition,

Mr. RICE said he wished to explain that there were two resolutions with which he did not agree. The first was that referring to the compensation to the staff; but as to this he bowed to the majority. With regard to the extra remuneration of the Directors, however, he felt this was a shareholders' question; and therefore he voted against it at the Board.

On being put to the meeting, the resolution was declared carried by seven votes to five.

This concluded the proceedings.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

At the 65th ordinary general meeting of the Cork Gas Consumers' Company, last Friday, the Directors reported that, as compared with the corresponding period of the preceding year, the accounts for the six months ending June 30 last showed a small increase in the rental; while the receipts for residuals slightly improved. The high price of coal seriously affected the profits during the half year; but the Directors had for some time past been receiving deliveries contracted for at much lower rates. The facts connected with the strikes had already been made known in the pamphlet sent out (see *ante*, p. 350). During the present strike, the business at the works had been carried on under great difficulties, and with much inconvenience to the consumers; and the Directors gratefully thanked them for their forbearance under most trying circumstances. The balance of profit and loss was £854, and they recommended a dividend at the rate of 4 per cent. per annum; making with the dividend paid in the previous half year 6 per cent. As this would amount to £2764, it was necessary to take £1910 from the reserve fund.

The harmony which usually prevails at the half-yearly meetings of the Eastbourne Gas Company was disturbed at the assembly of shareholders on Monday last week, owing to one of this body—Mr. H. Mandy Simmons—having issued a letter complaining that he had been refused access to some of the Company's books. On this account, and owing to the proposed election of a new Director, the attendance was unusually large. Before the business was formally opened, Mr. Simmons, rising in his place, complained that he had been refused an opportunity of inspecting several of the books of the Company. The Manager (Mr. J. Hammond), he said, told him that if he obtained an order from the Secretary he should still refuse to show the books at the works. The Secretary (Mr. J. H. Campion Coles) said Mr. Simmons had seen all the books at his office—more, in fact, than he was entitled to. Mr. Simmons said he wanted to see the books at the works; he demanded to see all the books relating to the Company. He declined to discuss the balance-sheet with only a partial inspection of the books; and unless the meeting were adjourned so that he might make his examination complete, he should retire, and take such legal proceedings as might be necessary to enforce his right. The Chairman (Dr. G. A. Jeffery) said the Secretary had shown Mr. Simmons all the books. Mr. Simmons emphatically denied this. He then proceeded to gather up his papers and some books he had with him, and withdrew. The ordinary business was thereupon proceeded with. The report presented set forth that the revenue account showed a profit for the half year ending June 30 of £6111, which, added to £11,895 brought forward, after payment of the dividend in February last, and deducting interest, made a total of £17,894 to the credit of the profit and loss account. The Directors therefore recommended that a dividend be declared at the rate of 14½ per cent. per annum upon the original capital and upon the amount raised on "C" shares, and at the rate of 11½ per cent. upon the £77,000 raised on "B" shares. These payments would absorb £6783, and leave a balance of £11,111 to be carried forward. The Chairman, in moving the adoption of the report, said that during the half year the Company had sold 150,247,900 cubic feet of gas, against 142,301,000 cubic feet—an increase of 7,946,000 cubic feet, or at the rate of 11·2 per cent. The profit was £6111, as against £7667 in 1900. He could mention something like twenty companies between Margate and Land's End who had not done anything like so well as they had at Eastbourne; and nearly all of them had raised the price of gas. The profit earned in the half year, added to that of the previous six months, had been subjected to a forfeiture of £3500, by which the Company had been relieved of a contract which added 8s. 6d. a ton to the coals. They were indebted greatly to their friends Mr. Worley (the Auditor) and Mr. Jones (the Consulting Engineer) for the arrangement made. The result of the working was that the Company were able to pay their full dividend by drawing only £785 from the reserve, compared with from £5000 to £8000 drawn by other companies on the coast. Mr. J. Farncombe seconded the motion. The Chairman asked that the Auditor might be allowed to make a few remarks. Mr. Worley, referring to the action of Mr. Simmons, said that gentleman had had all the principal books placed at his disposal. After some observations from shareholders, the report was adopted with one dissentient. The retiring Directors having been re-elected, Alderman Farncombe was chosen to fill a vacancy on the Board. Mr. Worley was re-appointed Auditor. A proposal to increase the remuneration of the Directors by £200 per annum was negatived. On the motion of the Chairman, a vote of thanks was accorded to the Secretary, Consulting Engineer, Manager, and the employees, which was acknowledged by Mr. H. E. Jones. He said he knew no works where the whole thing rolled more smoothly along than at Eastbourne. This was largely due to the fact that the men recognized that in Mr. Hammond there was always a spirit of moving ahead, and pushing on the business, but still showing proper consideration for them. Referring to the action of Mr. Simmons, he said such circulars as that gentleman sent out damaged the property; and he warned the proprietors not to encourage such proceedings. Mr. Hammond had given Mr. Simmons what could not be produced without an order from the House of Commons or from a Judge of the High Court of Justice. A vote of thanks was then passed to the Chairman, and the proceedings closed.

Presiding at the annual meeting of the Falmouth Gas Company on Monday last week, Mr. J. Mead said the price of coal had been so high

that it had been difficult to make ends meet. It was a matter for congratulation that they were able to earn a fair profit, and also that the works were in such an excellent condition. For the first time in their history, the production of gas had decreased; one of the chief causes being the reduction of 17 per cent. in the town lamps. In making this reduction, the Council were unreasonable; and he questioned very much whether they were within their rights in making it. The value of the Falmouth works was higher than that of the Truro works, and none in the West of England were more complete and up-to-date. Owing to the lower price of coal, they had been able to reduce the price of gas to 3s. 10d. per 1000 cubic feet; and he hoped this was only the beginning of good things. The Directors recommended the payment of the balance of the statutory dividend of 5 per cent. for the past half year. The report was adopted.

The Directors of the Gloucester Gas Company, in their report, state that, after providing for interest on mortgages, &c., the net profit for the past half year is £2572, which, added to the amount brought forward, makes a sum of £5413 available for distribution. The Directors recommend the payment of the statutory dividend of 5 per cent. per annum upon the ordinary stock, which will absorb £4187, and leave a balance of £1226 to be carried forward. There was a satisfactory increase in the consumption of gas, as well as in the number of consumers, during the six months covered by the report.

The Hartlepool Gas and Water Company's annual meeting was held on Thursday—Mr. W. H. Fisher, J.P., in the chair—when the report referred to in the "JOURNAL" for Aug. 20 was presented. The Chairman, in moving its adoption, said that although the year had been an unfortunate one from a financial point of view, in consequence of extra expenditure, the consumption of both gas and water showed an increase. Gas showed an increase of 12,809,483 cubic feet; the total make having reached 435,912,100 cubic feet, and this after the introduction of electric lighting during the last six months. The returns up to last July showed a considerable increase upon those of the corresponding half of last year. The number of cookers used was very satisfactory; there being 848 employed, an increase of 103 on last year. The number of heating stoves and automatic meters was also satisfactory; there being now 3290 of the latter in use, an increase of 604 for the year. The gross revenue derived from gas was £71,640, and from water £25,638—an increase of £11,463. The net revenue from gas was £11,955, and from water £13,982—showing a decrease of £4011. This decrease was due to the extra cost of coal, £10,128, the increase of rates and taxes, increase of wages to the extent of £593, and £2587 parliamentary costs incurred by the unsuccessful Bill promoted by the Corporations of Hartlepool and West Hartlepool to purchase the Company's undertaking. These were items which, except perhaps for the wages, were not likely to occur again. The total increase in the expenditure on gas and water for the year amounted to £15,474. The new contract which they had been able to enter into for coals had been made on more favourable terms, and the Directors had been able to reduce the price of gas 3d. per 1000 cubic feet. Owing to the fire which destroyed the sulphate works early in the year, the revenue for the sale of ammonia had decreased about £1379; but, on the other hand, the sale of coke had produced £2216 more than last year, and the receipts for ammoniacal liquor had increased by £431. The increase in the sale of water amounted to about £800. Some 530 million gallons had been sold for business purposes and about 748 millions for domestic use. The report was adopted.

In the report which the Directors of the Hastings and St. Leonards Gas Company will present at the half-yearly general meeting next Thursday, they state that very considerable progress has been made in preparing the ground and foundations for the erection of the new works at Glyne Gap; and a contract has been entered into with Messrs. John Aird and Sons for laying a trunk main between Hastings and Glyne, which work is proceeding satisfactorily. The accounts accompanying the report show that the sale of gas in the past half year produced £34,698; residuals realized £9409; and the total revenue was £46,596. The expenditure on coals, oil, carriage, &c., was £22,250; the coal duty paid to the Corporation was £2023; distribution came to £2838; and management to £1563—the total expenses being £37,250. The balance carried to the profit and loss account is £9346; and the sum available for distribution, £50,042. Out of the profit balance, it is proposed to pay the statutory sliding-scale dividends at the rate of 6 per cent. per annum on the converted 5 per cent. stock, and of 4½ per cent per annum on the 3½ per cent. converted stock, both less income-tax, and to carry forward the balance. Under the supervision of Mr. C. E. Botley, M.Inst.C.E., 16,793 tons of coal, 207 tons of cannel, and 129,785 gallons of oil were employed in the production of 219,523,000 cubic feet of gas (47,768,000 cubic feet being oil gas), of which 210,268,700 cubic feet were sold and 212,463,900 cubic feet were accounted for. The estimated quantities of residuals produced were: Coke, 10,490 tons; breeze, 634 tons 17 cwt.; tar, 176,816 gallons; and ammoniacal liquor, 314,473 gallons.

The half-yearly general meeting of the Riddings District Gas Company was held on the 23rd ult., when the accounts presented showed that the revenue in the six months ending the 30th of June was £2569, and the expenditure £1743; leaving a balance of £826 to go to the profit and loss account. The amount available for distribution was £2921; and the Directors recommended the declaration of a dividend at the rate of 7 per cent. per annum, free of income-tax.

At the annual general meeting of the Salisbury Gas Company, the Chairman (Mr. G. Fullford), in moving the adoption of the report and the payment of the usual dividends on the various classes of shares (ranging from 5 to 10 per cent. per annum), said that the results of the year's working were satisfactory, notwithstanding the large increase in the price of coal in June, 1900, which had followed upon a series of smaller advances commencing in 1897. To meet this, however, they had a substantial augmentation in the quantity of gas sold, and also in the sales of coke. The fact that the sales of gas increased, in spite of the extended introduction of the incandescent burner, which did not use half as much gas as the flat-flame, showed the solid character of the Company's business. The incandescent mantle gave a beautiful light, but it required some care and attention; and this the Company were now supplying by undertaking the maintenance at a fixed charge—an arrangement which was giving great satisfaction to the customers. Mr. W. Young seconded the motion, and in doing so congratulated the shareholders on the fact that, in these days of declining dividends, the Company had been able to keep up to the usual rate, and maintain a standard that had not been broken for several years. The retiring Directors and Auditor having been re-elected, Mr. A. Watson proposed a vote of thanks to the Chairman, Directors, and officers of the Company for their services during the past year. Referring to the Engineer (Mr. Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.) and his assistants, he said they were appreciated in the district, and it was evident that they had done their work well. The proposition having been carried with applause, Mr. S. R. Atkins responded on behalf of the Board. He said the Directors had all done their best; and Mr. Humphrys deserved everything that had been said. He was glad to have an opportunity of making this remark. As purveyors of light and heat, they must expect to meet with vicissitudes, such as fluctuations in the cost of coal and iron; and, with regard to the future, they had evidently reached an era when better service was required, and possibly more competition would be encountered, than in times gone by. Mr. Humphrys thanked Mr. Watson and Mr. Atkins for their kind references to himself and to the staff. He said he had fully recognized that it was necessary to move with the times, and had attempted to do so; and he might venture to say that his endeavours had been attended with some measure of success. A large portion of this was, of course, due to the assistance of the staff in general, every one of whom had done his best to promote the welfare of the Company. The proceedings then closed.

The accounts to be presented at the annual meeting of the Sunderland Gas Company to-morrow show that the total revenue for the year ending June 30 was £148,612; and the expenditure, £134,390—leaving a balance of £14,222. Owing to the extraordinary rise in the cost of coals in 1900, the Directors were compelled to advance the price of gas. But during the depression which occurred in March last, they made contracts for their current year's supply; and although residuals have fallen in proportion, they have felt themselves justified in reverting to the low price for gas which prevailed before the advance, trusting that a material increase in consumption will result An interim dividend was paid in March last, and the Directors recommend the declaration of a like dividend of 5 per cent. on the original stock and of 4¼ per cent. on the additional stock of the Company, less income-tax.

The half-yearly meeting of the Tonbridge Gas Company was held on Monday last week. The revenue account showed a profit of £1928, which, added to the balance of £3516 brought forward, made a total of £5444 available for distribution. The Directors recommended dividends at the rates of 10¾, 7¾, and 5 per cent. per annum, the payment of which would absorb £1237, and leave a balance of £4207 to be carried forward. The Chairman, in moving the adoption of the report, stated that the results of the half-year's working were in the greatest degree satisfactory. He referred to the high price of coal, which had cost upwards of 50 per cent. more than during the corresponding period of last year. The actual amount of increase in the price of gas necessary to meet the extra cost of coal, after allowing for residuals, was 7½d. per 1000 cubic feet; but they had raised it by 4d. only for nine months, and had now reduced it again to the original price of 3s. He considered the Company had treated the consumers in a very liberal manner. They had made a favourable contract for coal for the ensuing year. The increase in the consumption of gas for the half year was nearly 5 million cubic feet, or 17·1 per cent. During the past six years, the day consumption of gas had quadrupled, while the night consumption had doubled. The day consumption in midsummer and midwinter was equal to, or more than, the night consumption. The minimum output per day in summer was more than one-half of the maximum in winter. The Assessment Committee had raised the rateable value of the Company's property by 50 per cent.; but they had successfully appealed, and brought it down to the original figure—effecting a saving of £105 per annum. The report was adopted, and the dividends recommended were declared. The meeting closed with a hearty vote of thanks to the Directors, as well as to the Secretary and Manager (Mr. James Donaldson).

The half-yearly general meeting of the Wolverhampton Gas Company was held last Tuesday—Mr. C. C. Smith in the chair. In moving the adoption of the report, noticed last week, the Chairman expressed his gratification that the Company had been able to earn the usual dividends. There had, he said, been great difficulties to contend with in regard to the high price of coal, as they had had to pay 5s. a ton more for this material, which, in his opinion, was 1s. 6d. per ton worse than that which they had had before. The price of residuals had also gone down considerably. At the present time, contracts had been entered into for the purchase of coal at a reduction of 25 per cent.; but, on the other hand, buyers of coke were offering 75 per cent. less than before. Under these circumstances, there appeared to be a difficulty to contend with in earning the dividend for next year; but they hoped to be successful. Mr. Crane seconded the motion. He said the Directors had experienced great trouble in earning the dividend. The reductions which had been secured on the new coal contracts were slight; and as there was a probability of much less being obtained for residuals and coke, the outlook as to earning the next dividend was not bright. The motion was adopted; and the usual dividends were declared.

Water Companies.

At the half-yearly meeting of the Barnstaple Water Company on Monday last week—Mr. E. Dennis presiding—it was reported that the profit and loss account showed a disposable balance of £1229, out of which payment of dividends at the rate of 10 per cent. per annum on the "A," and 7 per cent. per annum on the "B" shares was recommended. The balance in the hands of the Treasurer was £1526. The Chairman, in moving the adoption of the report, said the works were in a very satisfactory condition. There was an excellent supply of water, and there had been no occasion to turn it off during the dry season, which was, he thought, a matter for congratulation. The report was adopted.

The annual general meeting of the Lewes Water Company was held last Wednesday—Mr. F. Verrall in the chair. In their report, the Directors stated that the accounts for the year ended the 24th of June last, showed that the receipts (less about £46 for empty houses and

irrecoverable rents) were £4264, while the expenses were £1866. The amount available for distribution was therefore £2398. The interim dividend paid in February last amounted to £1090; so that there was now for disposal the sum of £1308. The Directors recommended the following dividends: 5 per cent. upon the original capital (making 10 per cent. for the year); 3½ per cent. upon the additional capital (making 7 per cent.); and 2½ per cent. upon the preference stock (making 5 per cent.); and, in addition, the payment to the holders of the original shares the sum of 15s. per share in part payment of the arrears due to them. These dividends, with the additional payment to the holders of the original shares, would absorb £1270, and leave £38 to be carried to the reserve fund account, which would then amount to £636. The Manager (Mr. A. Wells) reported that the whole of the Company's machinery and works were in a satisfactory state. The report was adopted.

The 67th half-yearly meeting of the Luton Water Company was held on Thursday—Mr. B. Seebohm (the Chairman) presiding. According to the Directors' report, the balance shown by the net revenue account was £3318. Out of this they recommended payment of the maximum dividend of 4 per cent.; the remainder (£683) being carried to the renewal and contingency fund, which, with interest on its investments, now stands at £8076. The Engineer (Mr. W. R. Phillips) reported that all the Company's plant and buildings had been maintained in thorough efficiency. The water-tower on Bailey Hill was now completed, and was supplying that high-level district. The Chairman stated that the two water-towers on Bailey Hill and Hart Hill had cost £11,000, and there was not very much return at present visible; but the Company were able to supply Stopsley with pure water. The revenue account showed a steady increase, representing £617 in twelve months. The capital expenditure up to June 30 was £78,910. The report was adopted.

Mr. Frank James presided last Thursday over the half-yearly meeting of the proprietors of the South Staffordshire Water-Works Company. The report, which was noticed in the "JOURNAL" for the 13th ult., showed an available balance of £22,657; and it was proposed to pay a dividend at the rate of 5½ per cent., free of income-tax, carrying forward £6294. In making the proposal, the Chairman referred to the long services of Mr. Henry Haselden, who, after being Secretary to the Company for 38 years, had retired on an annual allowance of £400. With regard to the accounts of the Company, he thought they were satisfactory. The number of houses laid on during the half year was 1867, making the total supplied 110,527. What South Staffordshire would do without the Company he did not know; but it was certain that if all the localities had to furnish their own supply, it would require not £1,000,000 but nearly £2,000,000 of capital. There were very few places they did not supply, and the Company were always ready to lay down pipes in new streets where there was a chance of a new population coming among them. There were one or two districts where there had been a falling off in the trade supply, more particularly at Burton and Smethwick; but he was inclined to think those trading concerns would come back after they had had a little experience in providing their own supply. The increased price of coal was the chief cause of the increase in the cost of production, and it was principally due to this factor that their dividend had dropped from 6 to 5½ per cent. Some of the shareholders might think, seeing that they were carrying forward £6294, against £5745 last year, that they could have reverted to the old 6 per cent. So they could, as a matter of fact; but the Directors thought it wiser to pay the smaller dividend for the present half year. The dividend was, however, really 5¾ per cent., seeing that it was free of income-tax. Sir H. Wiggin seconded the proposal, which was unanimously adopted. Subsequently an extraordinary meeting was held, at which it was decided to authorize the Directors to create £100,000 of new stock, partly as preference and partly as ordinary.

The half-yearly meeting of the East Worcestershire Water-Works Company was held in Birmingham last Thursday—Lord Windsor (the Chairman) presiding. The Chairman, in moving the adoption of the report (see *ante*, p. 461) stated that the extensions which had been undertaken were proceeding satisfactorily, and the yield of water was quite as much as the Directors anticipated. Their arrangement with the Corporation of Birmingham was for the supply of surplus water, and the supply so far had been larger than they undertook to give if they had any to spare. Instead of 500,000 gallons daily, it had averaged 550,000 gallons. They bore in mind the necessity for keeping the mains and machinery in thoroughly good working order; and they had recommended that £1200 be added to the depreciation reserve—this amount being £200 more than had been usual in recent years. Mr. Noel, in seconding the motion, remarked that there was an impression that they were likely to supply Birmingham with water to the detriment of their own customers; but this was not so. The water they were supplying was that which would ordinarily run to waste. The report was adopted, and a dividend for the half year at the rate of 4 per cent. per annum was declared.

SHEFFIELD CORPORATION WATER UNDERTAKING.

Its Position and Prospects.

The Chairman of the Water Committee of the Sheffield Corporation (Alderman Gainsford) has addressed to the members a letter in which he deals at some length with the position and prospects of the undertaking of which they have control. He explains at the outset that, a it is now about fourteen years since the concern came into the hands of the Corporation, he thinks the time has arrived when its progress may be reviewed with profit. The letter is divided into three parts. In the first, the circumstances which led up to the transfer of the undertaking are recalled; in the second, suggestions are offered as to the present course of action; and in the third, a glance is taken into the future. The following are the chief portions of the letter:—

I.—What immediately led to the Transfer Act of 1887 was a Bill by

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 565.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 12	10½	Alliance & Dublin 10 p.c.	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0
200,000	5	May 15	6½	Bombay, Ltd. . . .	6¼—6¾	+¼	4 16 4
40,000	5	,,	6½	Do. New, £4 paid	4¼—4¾	..	5 9 5
380,000	Stk.	Aug. 15	12	Brentford Consolidated	260—265	..	4 10 7
270,000	,,	,,	9	Do. New	187—192	..	4 13 9
50,000	,,	,,	5	Do. 5 p.c. Pref. .	126—130	..	3 16 11
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	111—114	..	3 10 2
220,000	Stk.	Mar. 14	10	Brighton & Hove Orig.	222—227	..	4 8 1
246,320	,,	,,	7	Do. A. Ord. Stk. .	155—160	..	4 7 6
1,047,500	Stk.	Feb. 27	5	Bristol, 5 p.c. max. .	121—123	..	4 1 4
420,000	20	Mar. 28	10	British.	41—42	..	4 15 3
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
82,850	10	,,	9	Do. 7 p.c. . . .	19—21	..	4 5 8
500,000	10	May 31	6	Buenos Ayres (New) Ltd.	9—9¼	+¼	6 6 4
220,000	Stk.	June 28	4	Do. 4 p.c. Deb.	94—97	..	4 2 6
150,000	20	July 17	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	May 31	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
550,000	Stk.	Apl. 12	12	Commercial Old Stock	270—280	..	4 5 9
236,425	,,	,,	9	Do. New do. .	205—210	..	4 5 9
238,237	,,	June 14	4½	Do. 4½ p.c. Deb.	128—133	..	3 7 8
800,000	Stk.	May 31	9	Continental Union, Ltd.	158—163	..	5 10 5
200,000	,,	,,	7	Do. 7 p.c. Pref.	162—167	+2	4 3 10
575,000	Stk.	Aug. 29	5	Crystal Palace Ord. 5 p.c.	120—125*	+2½	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—128*	..	3 18 2
486,090	10	July 17	10½	European, Ltd. . . .	19—20	..	5 5 0
354,060	10	,,	10½	Do. £7 10s. paid	14—15	..	5 5 0
15,079,885	Stk.	Aug. 15	4⅞	Gas-light & Coke { 4 p.c. Ord. . .	91—93	+1	4 14 7
2,600,000	,,	,,	3½	3½ p.c. max. .	88—90	..	3 17 9
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	110—113	..	3 10 10
4,063,425	,,	June 14	3	Coke 3 p.c. Con. Deb.	91—93	..	3 4 6
70,000	10	May 31	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	May 15	10	Imperial Continental .	208—211	..	4 14 9
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	99—101	..	3 9 4
561,000	Stk.	Feb. 28	10	Liverpool United A	236—238	..	4 4 0
718,100	,,	,,	7	Do. do. B	173—175	..	4 0 0
306,083	,,	June 28	4	Do. do. Deb. Stk.	118—120	..	3 6 8
75,000	5	June 14	4	Malta & Medn., Ltd. .	4¼—5	..	4 0 0
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	106—109	..	4 11 9
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	May 31	3½	Monte Video, Ltd. . .	9—10	..	7 0 0
717,946	Stk.	Aug. 9	8½	Newc'tle & G'tesh'd Con.	225—227	..	3 14 11
312,855	Stk.	June 28	3½	Do. 3½ p.c. Deb.	97—99	..	3 10 8
150,000	5	May 15	8	Oriental, Ltd. . . .	7⅞—8¼	+⅛	4 17 5
135,000	5	,,	8	Do. New, £4 10s. pd.	7—7⅛	+⅛	4 16 0
15,000	5	,,	8	Do. do. 1879, £1 pd.	1⅛—1⅜	..	4 11 5
					*Ex. div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Feb. 28	7	Ottoman, Ltd. . . .	5⅞—6⅛	..	5 12 0
851,070	10	Apl. 26	7	River Plate Ord. . .	10½—11¼	..	6 4 5
250,000	Stk.	June 28	4	Do. 4 p.c. Deb..	96—98	..	4 1 8
250,000	10	Mar. 28	8	San Paulo, Ltd.. . .	10½—11⅓	..	6 19 1
135,000	Stk.	Mar. 14	10	Sheffield A	240—245	..	4 1 8
209,984	,,	,,	10	Do. B	240—245	+2	4 1 8
523,498	,,	,,	10	Do. C	240—242	+1½	4 2 8
5,761,885	Stk.	Aug. 15	5	South Met., 4 p.c. Ord.	124—127	+1	3 3 0
1,627,965	,,	July 17	3	Do. 3 p.c. Deb. . .	91—94	..	3 3 10
380,940	Stk.	May 15	5	Southampton Ord. . .	106—111	..	4 10 1
70,825	,,	July 17	4	Do. 4 p.c. Deb.	104—109	..	3 13 5
120,000	Stk.	Aug. 29	5½	Tottenham and Edmonton { A. 5 p.c.	113—118*	..	4 13 3
250,520	,,	,,	4	B. 3½ p.c.	82—87*	..	4 12 0
182,380	10	Jan. 16	5	Tuscan, Ltd.. . . .	8—9	..	5 11 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—100	..	5 0 0
230,000	5	Aug. 15	9	West Ham, 10 p.c. . .	9—10	..	4 10 0
172,000	10	,,	6	Do. 7 p.c. . .	11½—12½	+½	4 16 0
140,900	Stk.	June 28	4	Do. 4 p.c. Deb.	103—108	..	3 14 1
				WATER COMPANIES.			
780,599	Stk.	June 28	11	Chelsea, Ord. . .	287—292	+2	3 15 4
150,000	,,	,,	5	Do. 5 p.c. Pref. .	150—155	..	3 4 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	137—140	..	3 4 4
175,785	,,	Mar. 28	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Apl. 12	7	East London, Ord.. .	187—192	..	3 12 11
654,740	,,	June 14	4½	Do. 4½ p.c. Deb. .	143—148	..	3 0 10
980,169	,,	,,	3	Do. 3 p.c. Deb. .	94—96	..	3 2 6
700,000	50	June 14	8	Grand Junction { 10 p.c. max..	103—106	+1	3 15 6
310,000	Stk.	Mar. 28	4	4 p.c. Deb..	123—127	..	3 3 0
708,000	Stk.	Aug. 15	14	Kent	275—285	..	4 18 3
160,000	,,	,,	7	Do. New, 7 p.c. max..	198—203	..	3 9 0
1,043,800	100	June 28	10½	Lambeth, 10 p.c. max..	267—272	+2	3 17 2
406,200	100	,,	8	Do. 7½ p.c. max..	204—209	..	3 16 7
350,000	Stk.	Mar. 28	4	Do. 4 p.c. Deb..	124—127	+1	3 3 0
500,000	100	Aug. 15	12⅛	New River, New Shares	390—395	..	3 4 6
1,000,000	Stk.	July 31	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	June 14	6	Southwark and Vauxhall { Ord. . . .	172—177	..	3 7 9
126,500	100	,,	6	7½ p.c. max.	162—167	..	3 11 10
489,200	Stk.	,,	5	5 p.c. Pref..	147—152	..	3 5 9
1,019,585	,,	Apl. 12	4	4 p.c. A Deb.	124—127	..	3 3 0
1,155,066	Stk.	June 14	10	West Middlesex. . .	265—270	+1	3 14 1
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	138—143	..	3 2 11
200,000	,,	Mar. 14	3	Do. 3 p.c. Deb. .	95—98	..	3 1 3
					*Ex. div.		

the late Water Company in the session of that year, mainly for two purposes—first, to perpetuate to the Company the extra 25 per cent. upon the water charges of 1853 which had been granted by the Act of 1864 only for a specific purpose and for a limited period, and also to authorize serious further additional charges for filtration and for treatment of the water against lead poisoning. The Corporation met these demands by offering to acquire the undertaking, and to work it for the people and trade of Sheffield, without any of these additional charges; and the promoters pledged the Corporation by a promise to this effect.

The result was the well known, and often quoted, decision of the late Lord Derby's Committee of the House of Lords, which, while enforcing the transfer of the water undertaking upon grounds of public policy, gave extremely liberal terms in favour of the Company; and the transfer was then negotiated and agreed to without further litigation in the second House of Parliament, and without any of the usual heavy arbitration costs, and by a system of annuities which obviated all raising of capital. But the terms prescribed by Parliament necessitated a continuance, first of the whole, and latterly of one-half, of the 25 per cent. additional charges until now.

The Corporation have always, however, borne their pledge in mind, and it will be finally fulfilled on the 29th of September by the cessation of the remainder of the 25 per cent., 4¼ years earlier than the existing Acts of Parliament require. The proposed extra charges for filtration and for treatment against lead poisoning have never been thought of under the Corporation. The reduction of water charges by cancelling the 25 per cent. amounts to about £27,000 a year—which is equal to 5d. in the pound upon the district rate.

Although the water consumers and the ratepayers are not technically identical, they are so far the same that this reduction of £27,000 a year is a real set-off of 5d. in the pound against the district rates, and everyone in the city who takes water is an absolute gainer to this amount. The whole of that £27,000 a year, with its proportionate increases annually in perpetuity, would have gone as private profit into the pockets of the shareholders of the Water Company, if the Bill of the Company in 1887 had passed, instead of that of the Corporation. Besides which there is what now almost goes without saying—that, in a great community like this, the water supply ought, upon public grounds, to be in the hands of the public authority, and not the subject of private profit.

At the same time, the transfer has worked very well for the shareholders, and the decision of Parliament has done full justice, as is right, to those who, or whose predecessors, came forward with their money to supply a public need at a time when the pecuniary result was a risk and not a certainty; for it is seen that the £100 ordinary share of the Company, which at the beginning of 1887 was only worth £67, is now represented by a Corporation annuity of which the market value to-day is about £115, and is still increasing.

Equally also the financial advantage to the city is not limited to wiping out the 25 per cent., but is further shown by the following statement of the additional revenue of the undertaking since it came into the hands of the Corporation, and the manner of its disposal: In 1887 the gross revenue was £83,310; and the expenses were £14,224—leaving a net balance of £69,086. Last year the gross revenue (including the 25 per cent. for comparison with 1887) was £150,941; and the expenses were £22,865—leaving a net balance of £128,076. To this is added, by reduction of interest on loans, £9106; making a total net balance of £137,182, or an increase over that of 1887 of £68,095. The increase has been thus disposed of: Increased profit to the Company's shareholders, £10,132; salaries previously charged to capital, now charged to revenue, £700; interest do., £2257; interest on new capital since 1887, £8809; additional payments to local rates, £1529; treatment of Redmires water against lead poisoning, £174; instalments to sinking fund for redemption of the freehold, £6850; first half of the 25 per cent. written off, £12,160 (making together £42,611); surplus for the year 1900-1901, added to reserve fund, £25,484—total, £68,095.

II.—So far as regards the past. I would now set down a few facts as to the present supply and the present course of action, and pass on to the prospects of the future. The present daily supply of water by the undertaking, upon the average of last year, is 10,583,832 gallons. The population actually supplied is 409,561; so that the average consumption is 25·84 gallons per head, this figure including supplies in bulk to local authorities outside the city, equal to 3·25 gallons per head of the whole population.

The existing works are being severely drawn upon, and there is no doubt but that the next increase of supply (Langsett) is already overdue, and is urgently wanted at the earliest possible date. The calculations laid before Parliament in 1899 (and which have been exceeded rather than the reverse in 1899 and 1900) showed that Langsett and Underbank (Little Don Valley works) would be exhausted in 1910, and that the then sole remaining source of supply, the Ewden works, would be exhausted in 1924; and the supposition was that whatever could be got from the Derwent would follow thereafter.

Accordingly, a resolution was passed by the Water Committee on June 6, 1900, and afterwards duly confirmed by the Council, as follows: "That, in view of increasing water requirements, and in accordance with the recent recommendations of the General Sub-Committee, the construction of the reservoirs and works in the Ewden Valley be proceeded with forthwith." No action, however, has been taken upon the resolution.

It became evident, as the result of Sheffield being made a partner with Derby, Leicester, and Nottingham in the Derwent scheme, instead of having direct control of its own works in the Derwent Valley, and of the obligation to construct the first section of the Derwent works forthwith, that, if the course of construction were carried out as proposed, Sheffield would be expending capital at the same time upon its own Ewden works direct, and upon the Derwent works through the Joint Board, and that the supplies of water would become available from both at about the same time. Thus the expenditure would be duplicated, and the two supplies together would cause an excess over requirements for some years.

If the order of construction could be changed, so that Sheffield should use its share of the Derwent water first (which, in any case, it would have to pay for), and Ewden afterwards, the loss would be saved;

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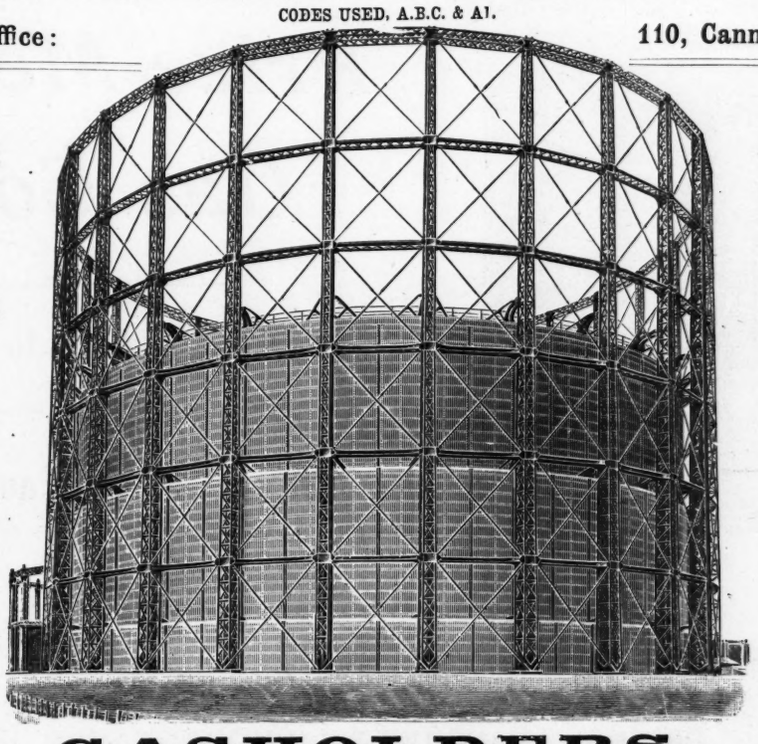

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but the difficulty was that the Acts required the completion of all the Ewden works by 1910. The Corporation Bill of the present session afforded a convenient opportunity; and the "Ewden" clause in that Bill (now passed into an Act of Parliament) was introduced, and has got over the difficulty, by authorizing the further postponement of the Ewden works, for the reasons explained.

We are able, therefore, now to make the proper arrangements without difficulty; and the intention will be to begin the use of Derwent Valley water as soon as it can be obtained—not later, at any rate, it is hoped, than 1910. In fact, if the present rate of increase is maintained, we may be in want of the Derwent supply by 1908 or 1909; and the recommendations which I now accordingly have to suggest are: (1) That the above-mentioned resolution for proceeding with the Ewden works be rescinded; and (2) that the tunnel to bring the Derwent water from Ashopton to Hollow Meadows be proceeded with at once.

III.—The course of construction of works and expenditure of capital being thus determined, it becomes practicable to forecast the future of the water undertaking with fair assumption of approximate correctness. A table of calculations has accordingly been prepared with great care by Mr. Terrey (the General Manager), showing the probable financial position annually until 1925—*i.e.*, until approaching the time when it is estimated that all the Derwent Valley water will be in use. This table, of course, takes no account of any part of the old 25 per cent., which is entirely done away with; and it provides successively for all the further capital expenditure, both direct and through the Derwent Valley Board. It begins with the present accumulated balance of £76,179; and the result is that it shows an almost constantly increasing surplus, until the sum becomes extremely large. It would be much larger but for the fact that the Little Don works are estimated to involve heavier charges (not so much for the reservoirs as from other causes) than was previously expected. Still, the calculated surplus is equal to a balance of about £9500 a year.

Obviously, it would not be wise to do anything now to dispose of anything like the whole of this surplus, for the contingencies of the past may be repeated in the future, even in excess of the liberal allowances in the table; and such items as "general and maintenance expenses," severe frosts such as that of 1895, unexpected falling off in trade, and other contingencies, have a way of defying all anticipation, especially when dealing with a period of so many years ahead. At the same time, it is right that the ratepayers and water consumers should not be taxed needlessly; and I venture to suggest that the facts and calculations now submitted offer an opportunity for some substantial amendments.

Of course, it must be borne in mind that, as the Act of Parliament actually stands, all surplus beyond an accumulation of £150,000 must be devoted to the reduction of charges for water. But I think it will be generally admitted that it would be unwise to throw away a municipal income by further reduction of the ordinary charges for water supply after they are brought into favourable comparison with those of other large towns in the country; and, as this is now already effected by the removal of the 25 per cent., and the ordinary charges are in themselves so small that any practicable reduction would be hardly appreciable (the charges are now down to 7s. 2d. per house per annum), I imagine it will be thought best to retain the water revenue, and to seek parliamentary sanction if any method of disposal be desired beyond what is authorized.

The first question, therefore, which I would beg to submit is, whether it is best to use what may be wisely disposed of, simply for purposes which would be practically in alleviation of the rates, and which would be duly provided for in any case; or for the attainment of some public object of importance for which rates are not ordinarily applicable, and which, therefore, would probably not be attained except by means of some such extraordinary source of income as that which we are considering. For, if matters be left alone, a needlessly large reserve would accumulate without any real benefit, and the charges would then be reduced slowly and by small fractions, which, while wasting away revenue capable in the aggregate of being turned to much useful purpose, would be almost inappreciable individually. Indeed, if the surplus be used either for simple reductions of charges or for purposes for which the ordinary rates are applicable, an opportunity and an income will be frittered away without anyone really feeling the better for it, and without anything being accomplished which would not equally be so, in the ordinary course, without it.

We have here a surplus of about £9500 a year, out of which some £6000 or £7000 may safely be taken, and expended without any new or additional charge upon the city; and I venture to submit that at least a considerable part of it may well be used for the benefit of the city and people, in such manner or objects as would not be attained, in all probability, if the rates had to be called upon or increased to effect them. I imagine there would be no difficulty in obtaining the necessary modification of the Acts of Parliament in view of the fact that our water charges will henceforth be already in favourable comparison with those of other towns. At the same time, and while thus suggesting a very direct and tangible disposal of a considerable share of the available surplus, I would also certainly devote a substantial part of it to concessions upon any particular water charges as to which it may be thought that so doing will lead to distinct advantage, especially to the health and personal comfort of the people.

Additional Pumping Plant for the Cincinnati Water-Works.—Contracts have been let for six auxiliary pumping-engines for the Cincinnati Water-Works. The first was for three self-contained vertical triple-expansion, crank and fly-wheel pumping-engines, each with 25 million gallons capacity in 24 hours. These engines are to be placed at the west end of a gravity tunnel for the purpose of pumping water to the Eden Park reservoir. The price at which this contract was taken was $410,500. The other three engines were of similar description, except that they are each of 12 million gallons capacity. These are to be placed at the west end of the tunnel, and are to be used for pumping water to the Eden Park tower and to the Mount Auburn tanks. The contract price is $391,900.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The accounts of the Aberdeen Corporation Gas Department for the year ending July 31 have been issued. They show the revenue to have been £112,905, and the expenditure £105,851; leaving a balance of £7054. The largest item of income was that for gas-rents, amounting to £91,681; and the other sources of revenue were £17,681 for residual products, £2856 from house-services, £1048 from gas-stoves, £238 from rents and feu duties, and £3 for transfer fees. On the expenditure side, the heaviest item was £86,974 for the manufacture of gas, of which £67,055 was paid for coal. The salaries of the Gas Engineer, Analyst, and officers at works amounted to £1250; while the wages of stokers and labourers absorbed £12,173, and £4075 was required for the maintenance of plant. Distribution of gas, including £1251 as wages of meter inspectors, cost £3183, house services required £2284, gas-stoves £1048, rents and taxes £6068, and management £1844; the management including £1123 for salaries. General charges amounted to £830, the largest item being £196 for share of expenses in Town House, the next highest being £157 for incidental charges, while £142 was set down for pensions and allowances. Discounts amounted to £3617, these including £503 of bad debts. The capital account showed the expenditure at July 31, 1901, to have been £307,726. The balance of revenue over expenditure was £7054, as compared with £16,977 in the preceding year, and £21,148 in the year previous to that. From this balance the following payments have to be met: Annuities, £4363; interest on mortgages, bank accounts, reserve fund, &c., £3974; amount carried to sinking fund for redemption of mortgages, £2900; amount set aside for the redemption of gas annuities, £6053; amount set aside to reserve of fire insurance fund in terms of the resolution of the Town Council, £300—total, £17,590. The net balance was £44, which, with the balance of £10,491 brought from last year's account, leaves the balance to be carried to next year's account at £10,535. The statistics as regards manufacture of gas show that the number of tons of coal carbonized was the largest recorded in connection with the undertaking, the total quantity amounting to 61,490, as compared with 56,913 tons in the previous year. The price of gas to consumers was 3s. 2d. per 1000 cubic feet, as compared with 3s. last year and 3s. 1d. in 1889. The figure is the same as in 1898; and up to that time that was the lowest price reached. The average price of coal per ton was the highest recorded since 1892, amounting as it did to 21s. 9¾d. per ton, as against 16s. 8½d. the previous year. In 1892, the price was 22s. 0¾d., which had only been five times exceeded—during the years from 1872 to 1875. The quantity of gas made was 616,493,000 cubic feet, as compared with 597,956,000 cubic feet in 1900. The quantity accounted for was 572,503,000 cubic feet, showing a loss of 43,990,000 cubic feet—a percentage of 7·13, as compared with 6·80. The loss otherwise, however, was under the average of previous years. The average quantity of gas made per ton in cubic feet was 10,026, as compared with 9979 the previous year. The gas-rental totalled £91,076—the largest on record. In the preceding year it amounted to £78,065. Coke yielded £9874, as against £7828 in 1900, £5641 in 1899, and £4706 in 1898. Tar and liquor yielded considerably less—namely, £7806, as compared with £9044 in 1900, that being the largest sum ever realized in one year. Bad debts amounted to £503, as compared with £343 in 1900, £213 in 1899, and £466 in 1898. The annuity account shows that there are 18,059 annuities, amounting to £4514. During the year 352 annuities were redeemed; the purchase price being £2859. The total annuities redeemed number 7941; the purchase price being £60,853, or, adding the unapplied balance, £64,138. The borrowing powers have been exercised to the extent of £133,304; but of this amount £49,173 has been paid off, leaving the mortgage debt at July 31, 1901, £84,131. In one of the tables appended, it is shown that the quantity of gas manufactured in 1872 was 146 million cubic feet. It is now, as shown above, over 600 million cubic feet. The revenue in the same period has risen from £33,100 to £91,075; and the price of gas has been reduced from 5s. per 1000 cubic feet to 3s. 2d.

In the Electric Lighting Department, the revenue was £19,176, of which £18,551 was derived from the sale of current. In the previous year the revenue was £14,211, of which £11,815 was from the sale of current. The expenditure last year was £9815; and there is left a gross balance of £9360. The net balance is £2169, which is to be carried to reserve fund, raising it to £4844. The Committee have resolved to fix the rates for current for lighting purposes at 6d. and 2d., and for motor purposes at 3d. and 1d., which is a reduction of from 3d. to 2d. for lighting; the reduction being made in order to encourage the lighting business.

The Gas and Electricity Committee have resolved to retain the price of gas at 3s. 2d. per 1000 cubic feet, notwithstanding that the estimates which were laid before them showed an apparent deficit of £1688. They held a meeting on Thursday at which they had under discussion, according to promise to consider it when the annual accounts were before them, the application by the men in the gas-works for an increase of wages; and they resolved, unanimously, not to entertain the application. This resolution was adopted in view of the anticipated deficiency for the current year, and also in consideration of the general condition of trade and the wages which are being paid in the city.

The Banff Gas Company, notwithstanding a rise in the price of gas last year, and a general movement for the closing of places of business in the town an hour earlier than before, were able to report an increased consumption of gas. The output for the year was 7,299,800 cubic feet. But the price of coal was £297 higher than it was in the previous year; and the profits (£225) were considerably under those formerly earned. A dividend at the rate of 4½ per cent. was declared, and a sum of £22 was carried forward. The Manager (Mr. W. Marshall), taking to heart the big outlay on coal for the past year, has turned his attention to enrichment by benzol. In a report to his Directors, he pointed out that cannel coal at about 30s. per ton could be dispensed with, and that there would be a probable saving, on the current year's working, of £226, if benzol were used. The Directors approved of the process

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being adopted; and Mr. Marshall has lost no time in having a Maxim carburettor fitted up. The apparatus is giving the utmost satisfaction. Coal gas of about 18-candle power is being enriched up to 25 candles. The fittings adopted are similar to those described by Mr. A. Yuill, of Alloa, in the paper he read before the North British Association of Gas Managers at Glasgow last July, only about a fifth of the total volume of gas being passed through the carburettor. Banff must be placed on the list of towns where the management of the gas undertaking is of the most up-to-date order. Such enterprise is deserving of recognition.

Maxim plant for enriching coal gas by benzol is also in use at Alyth, where it is working satisfactorily, and proving of great value.

On Tuesday last, a discussion took place before Lord Kyllachy, as Vacation Judge, in the Bill Chamber of the Court of Session, on an application by James and Matthew White, grain merchants, Bishop Mills, Old Dumbarton Road, Glasgow, asking that the Corporation of Irvine should be interdicted from drawing water from, and altering or diverting the water of, the Caaf stream, a tributary of the Garnock River, by means of a dam constructed by them across the Caaf for the purpose of taking water from the stream for the supply of the burgh of Irvine. The complainers, proprietors of mills on the Caaf and the Garnock, stated that the respondents' operations were interfering with their rights, and leaving an insufficient quantity of water to drive the mills. The respondents said that the district was threatened with a water famine; that they had applied for a Provisional Order, which had been granted, but on account of internal difficulties had not yet been confirmed, to give them power to increase the supply; and that they had carried through certain works to save delay in turning on the water when the statutory powers are granted. They denied that their operations had in any way injured the complainers' rights, which, the respondents averred, were worthless, although they wished to sell them at £400. Lord Kyllachy passed the note; and in respect of an undertaking not to draw any water from the Caaf until they have been statutorily authorized to do so being given by the respondents, refused interim interdict. He thought that the complainers might have acted unreasonably; but there was no doubt as to their legal right, which was not impeached.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 31.

Sulphate of Ammonia.—There has been more doing, and the market has throughout the week remained firm; the closing quotations being £10 7s. 6d. to £10 10s. per ton f.o.b. Hull and Leith, and £10 13s. 9d. f.o.b. Liverpool. There has also been good inquiry for September delivery, and for delivery up to the end of the year; and business has been done at a small premium in the earlier position. For September-December, however, makers are firm at their recent quotations; and no important transactions are reported.

Nitrate of Soda is unchanged, the quotations being 8s. 9d. to 9s. per cwt. on spot, for ordinary and refined qualities respectively.

LONDON, *Aug.* 31.

Tar Products.—There is really nothing fresh to advise as regards the markets generally. Pitch is very steady, and the demand for South Wales is still good, especially for September delivery. Very little is offering from London for prompt delivery; and prices are purely nominal, as consumers do not seem anxious to purchase forward from this port. In benzol, a small quantity of 90 per cent. has been sold at 9¾d. f.o.b. London for prompt shipment; while manufacturers still decline to sell forward, except at a marked improvement. In 50-90 per cent., there is nothing whatever doing. This quality appears to be entirely neglected. Anthracene remains in the same stagnant condition. There is no inquiry for the article; and it will probably be some time before any interest is taken in it. Crude carbolic acid continues to fall in value. Sales of 60's have been made at 1s. 10½d. for prompt shipment; while business is reported at 1s. 10d. for October-December. There is a rumour on this market that business has been done over all next year at 1s. 11d.; but considerable uncertainty prevails about this. Crystals remain in the same position; there are no buyers for prompt delivery, except at a considerable reduction on the English makers' quotations. Creosote continues quiet, especially in the Lancashire and Yorkshire districts, where makers appear anxious to sell for prompt delivery. A little business has been done in solvent, of specially fine quality, for home consumption in the London district; but the demand for export is still very limited. As regards tar, nothing of any great importance has transpired during the whole of the past week; but the general range of prices continues high as compared with those ruling for products.

The average values obtaining during the week are: Tar, 14s. 6d. to 18s. Pitch, east coast, 30s. 6d. to 31s.; west coast, 28s. to 28s. 6d. Benzol, 90's, 9¾d. to 9¾d.; 50's, 9d to 9¼d. Toluol, 10d. Crude naphtha, 4¼d. Solvent naphtha, 11d. to 1s. Heavy naphtha, 10d. to 11d. Creosote, 1d. to 1¼d. Heavy oils, 2d. Carbolic acid, 60's, 1s. 10½d. Naphthalene, 60s. to 65s.; salts, 30s. to 37s. 6d. Anthracene, "A," 2¼d. to 2½d.; "B," unsaleable.

Sulphate of Ammonia.—The market continues quiet; and there is very little business doing. Beckton still quotes £10 15s.; but they have not been able to arrange business on these terms. There are buyers at Hull at £10 7s. 6d. for good makes; but makers hold out for £10 10s. for forward delivery, and there is very little offering for prompt. Business is reported in Leith at £10 8s. 9d., and that to a considerable extent for prompt shipment; but makers decline to quote for next year, for which there appears to be a rather better inquiry at this port. The market for Liverpool is scarcely so firm, and there is not so much demand for prompt shipment. The nominal price is still £10 12s. 6d.; but buyers are not at all keen about purchasing for early shipment, and producers are not anxious to contract forward, except at a considerable improvement on existing prices.

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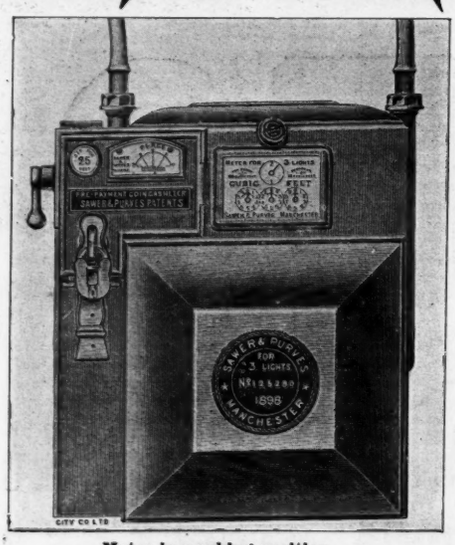

Meter in working position.

Meter with attachment removed without uncoupling.

COAL TRADE REPORTS.

Lancashire Coal Trade.—With the commencement of September, a substantially increased demand for house-fire requirements is looked for; and already representatives of collieries report generally that orders are coming forward more freely. Pits, however, have not yet got on to anything like full time, three to four days per week being still the average they are running, and the output so far continues more than ample to meet the present demand; while stocks of considerable weight have accumulated at most of the collieries. In fact, the stocks which have been put down this year are largely in excess of those held for several years past. Prices are firm at the list basis rates of 15s. per ton for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four feet and seconds Arley, and 11s. to 11s. 6d. for common house coals at the pit. Common round coals continue in not more than moderate demand for iron-making, steam, and general manufacturing purposes, and these are still plentiful; although, as the house-fire demand for common coals increases, this will naturally take off the market a good deal of the lower qualities of round coal that is at present offering for steam purposes. For prompt sales low figures continue to be taken, ranging from 8s. 6d. to 9s. per ton, with some collieries quoting 9s. 6d. to 10s. at the pit for good qualities of steam and forge coal. Of engine fuel, there is more than sufficient on the market to meet the demand; and when pits get on to full time, and there is a greater demand for screened coals, supplies of slack will be proportionately increased, so that there would appear to be a prospect of some easing down in prices. Already inferior sorts, which are the most plentiful on the market, have given way a trifle here and there, and can be bought readily in Lancashire at from 5s. 6d. to 6s. per ton, with slack from other districts offering from as low as 2s. 6d. upwards at the pit. The better qualities of slack are steady at late rates, averaging something like 8s. per ton at the pit in the Lancashire district. For shipment, there is more demand coming forward; but the prices taken are still extremely low—ordinary steam coals being obtainable at from 9s. 9d. to 10s. 3d. per ton delivered at the Mersey ports. Coke continues firm at full rates, with a fairly good inquiry both for foundry and furnace qualities. At the ovens, average prices are as follows: Good Lancashire foundry cokes 24s. to 25s. per ton, good washed Lancashire furnace cokes 13s. to 14s., good washed Yorkshire furnace coke 12s. 6d. to 13s., and unwashed sorts 11s. 6d. to 12s.

Northern Coal Trade.—The demand for coal is still full; and thus the prices are upheld generally. There is a steady inquiry for steam coals; and the prices are on the basis of 13s. 6d. per ton f.o.b. for best Northumbrian kinds, 12s. 6d. to 13s. for second qualities, and 5s. 6d. to 5s. 9d. for steam smalls. The collieries do not seem to be producing the normal quantity; and it is possible that the miners are in most parts of the coalfields taking rather more frequent holidays, and thus making coal a little scarcer. The chief feature in the gas coal trade is the scarcity of best Durham qualities, which are quoted as high as 11s. to 11s. 9d. per ton f.o.b. for occasional cargoes. Deliveries on contract are now increasing; and these and the exports take up the output almost entirely. It is long since there was such a scarcity of gas coals in Durham; and though the close of the Baltic season will change the position, there will then be a larger southern demand. This is causing the producers of best gas coals to ask slightly higher prices for forward contracts. In the coke trade, the demand is steady, and the price is firm at from 17s. 6d. to 18s. 6d. per ton f.o.b. for best Durham coke for export. Blast furnace coke is firm at from 15s. 6d to 16s. per ton free at the furnaces. Gas coke is without much change but the production is now increasing. About 12s. per ton is still the f.o.b. quotation.

Scotch Coal Trade.—The market is waiting the decision of the Arbiter in the matter of wages—Sheriff Jameson, of Perthshire—who heard the Conciliation Board on the subject last week. Until his decision is given, it is not expected that there will be much speculative trade. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 6d. to 11s. 6d., and splint 10s. 6d. to 10s. 9d. The shipments for the week amounted to 218,509 tons—a decrease upon the previous week of 17,667 tons, and upon the corresponding week of last year of 31,229 tons. For the year to date, the total shipments have been 6,250,050 tons—a decrease upon the corresponding period of last year of 692,803 tons.

Northam Water-Works.—An inquiry was held at Northam last week by Colonel Langton Coke respecting an application by the District Council for power to borrow £12,000 for the completion of the water-works. The Clerk explained that the effect of the expenditure on the works had been to largely increase the rates; and the Council therefore hoped that the Local Government Board would grant as long a term as possible for the repayment of the proposed loan. Mr. Baldwin Latham, Engineer of the scheme, stated that difficulty had been experienced in the construction of the reservoir, as the rocks were porous. It was, however, now completed. The total length of the mains was 40,500 feet, and some four miles of pipes remained to be laid. The expenditure on the water-works up to the 8th of August was £31,000. It was suggested that the works could not be completed for £10,000; and it was decided to increase the amount asked for to £14,000.

The South Metropolitan Gas Company's Workman-Director Scheme.—The scheme prepared by the Directors and adopted at the recent special general meeting of the South Metropolitan Gas Company, for enabling the employees holding ordinary stock to elect one or more of their number, but not exceeding three, to be a director or directors of the Company, was published in the "Gazette" last Friday. It has been approved by the Board of Trade, and will come into operation at once, and continue in force for nine years; but it is subject to cesser if the investment of the employees in the stock of the Company should fall below the nominal amount of £40,000, or if the shareholders should, in August, 1904, or again in August, 1907, be of opinion, on receiving a report of the working of the scheme from the Directors, that its continuance would be disadvantageous to the Company. The elections will take place between the 1st of September and the 1st of November in each year.

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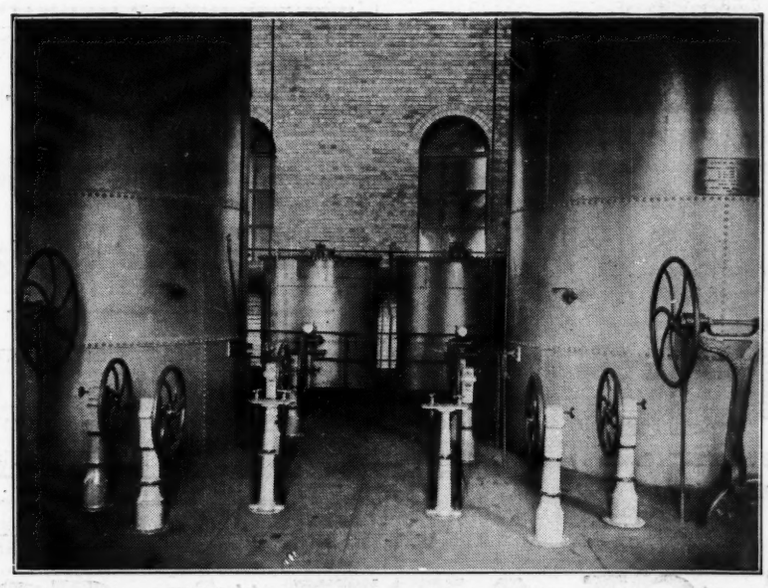

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The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 12 MILLION CUBIC FEET.

Gas v. Electricity for Heating Purposes.—In answer to an inquiry by a subscriber as to the comparative cost of heating by gas and electricity, the "Ironmonger" says: "There are no sufficient data available to enable such a comparison to be instituted. But the cost of electric heating is so far in excess of its rival as to render it an expensive luxury, especially if attempted on an extensive scale. In certain cases, however, the portability of the electric radiator (especially of the newer types), and its cleanliness and freedom from fumes or dangerous overheating, render it a very great convenience."

The New Chairman of the Ipswich Gas Company and the Employees.—Last Tuesday afternoon, the whole of the employees and staff of the Ipswich Gas Company were invited by Mr. D. Ford Goddard, M.P., the recently appointed Chairman, to his beautiful grounds at Oak Hill. The guests, mustering nearly 200, were served with dinner in a marquee. Mr. Goddard presided, and among those present were Mr. W. Alexander, the Vice-Chairman, and Mr. J. T. Jolliffe, the Engineer and Secretary of the Company. In the course of the after-dinner proceedings, Mr. Jolliffe spoke feelingly of the loss the Company had sustained by the passing away of their late Chairman (Mr. G. A. Biddell), who was beloved and respected by all who had known him. Great as their sorrow was, it was tempered by the fact that his place had been taken by an old friend—Mr. Goddard. All would recognize the immense advantage it was to have at their head a gentleman like Mr. Goddard, who knew the inner working and difficulties of the concern, and who was not only Chairman of their Company, but Deputy-Chairman of an important Suburban Gas Company; and he hoped that, with the help of all, the Ipswich Company would not fall into the background in comparison with other places. He moved a vote of thanks to Mr. Goddard for his kindness in inviting them there that night, and expressed the hope that he might live long, and be their Chairman for many years. Mr. James Lankester, one of the oldest employees, seconded the vote, remarking that, as in Mr. Biddell, so in Mr. Goddard, the workmen would never want a friend. The vote was carried by acclamation. In acknowledging it, Mr. Goddard related some interesting facts concerning the earlier management of the Company, and mentioned that it was thirty years since he was first officially taken into the service. It was a pleasure to see faces around him that were in the Company's employ at the time of which he spoke, while some had been in it much longer. Now that he had been chosen by the Directors to be Chairman of that important industry in Ipswich, which he felt to be a great honour, though he personally knew many of them, there were others whom he did not know; and he thought it well, on an occasion such as that, to get them together, and look into their faces, and he was very pleased to greet and welcome them in that pleasant and happy way. After referring in appreciative terms to the late Chairman, and to the Engineer and Secretary and the staff under him, he concluded by expressing the hope that they would all go on, hand to hand and heart to heart, seeking to make the best of their concern, but always trying to be just to everybody. The evening was brought to a close by the band playing the National Anthem, followed by cheers for the new Chairman.

Manchester's Water Difficulty.—At the meeting of the Water Committee of the Manchester Corporation last Thursday, they were informed that the stock of water in the reservoirs was equal to 37 days' supply, against 45 days' supply when the Committee met a fortnight ago. The rainfall in the interval had scarcely been an inch in extent. In these circumstances, and in face of the possibility of an almost rainless September, the Committee thought it would be imprudent to cease stopping the supply between 8 p.m. and 5 a.m., whereby a saving of about 5 million gallons daily is effected. The restriction will, therefore, be continued until there is an abundance of rain.

Meter Inspection in the District of Columbia.—According to the report of the Inspector of Gas and Meters for the district of Columbia (Mr. S. C. Ford) for the twelve months ending the 30th of June last, 4232 meters were inspected and proved in this period, of which 302 were fast, with an average error of 4·20 per cent., 573 slow, with an average error of 0·09 per cent., 3153 within the legal limits, and 204 did not register at all. There were 627 complaints by consumers of gas in regard to their meters; and of this number 279 registered fast, with an average error of 4·77 per cent., 63 registered slow, with an average error of 4·89 per cent., and 285 were within the limits allowed by law.

The Welsbach Patents.—Some weeks ago, a case in which the Welsbach Incandescent Gas-Light Company, Limited, sought an injunction to prevent the General Incandescent Company, Limited, from making and selling their "G.I.C." mantles, came before Mr. Justice Lawrance, by whom it was adjourned. The matter was subsequently considered by the Vacation Judge (Mr. Justice Joyce), when Mr. Bousfield, K.C., and Mr. Neil appeared for the respective parties. His Lordship reserved his decision, which was given last Wednesday. He refused to grant the injunction; the defendants undertaking to keep proper accounts of all mantles manufactured or sold by them. No order was made, except that the costs were to be costs in the action.

Leeds Gas Coal Contracts.—Statements which have appeared in the Leeds papers have given indications that the Gas Committee of the Corporation have lately been placing contracts for coal at prices considerably below the rates paid last year. Last Wednesday, the Chairman (Alderman Lowden) was able to announce that the whole of the arrangements for the forthcoming year had been completed. On his report, the Committee approved purchases amounting in the aggregate to 315,000 tons—one year's supply. It is stated that the prices range from 3s. 6d. to 5s. per ton below those of last year; therefore the Committee secure an average reduction of about 1s. 9d. per ton over and above the 2s. 6d. which the Associated Colliery owners offered them. These advantageous terms have been obtained by private treaty with a large number of firms. The new prices are still from 1s. 6d. to 3s. per ton higher than those of three years ago; but within the past two years the cost of gas coal to the Corporation has advanced as much as 6s. 6d. per ton. Deducting the average rate of reduction now effected, Leeds ratepayers have in prospect during the coming year a saving of something like £60,000 in round figures on their gas coal bill.

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Gas Explosion at Doncaster.—Last Wednesday night, an explosion of gas occurred at the brass-works of Messrs. Pegler Bros., in Union Street, Doncaster. The foreman, John Lee Moses, had just put a new washer on the ignition-tube of the gas-engine, and was lighting the tube when the explosion occurred. It is supposed that a quantity of gas had accumulated behind the valve. Moses was badly burnt about the hands, and his hair was singed and his face burnt. The door of the workshop was blown out, and two large windows were broken.

Checking Waste v. Extension of Works.—In the course of a report by Mr. G. I. Bailey, the Superintendent of the Albany Water Bureau, dealing with the filtering capacity of the water-works, he calls attention to the increasing quantity of water drawn off daily, owing to the wastefulness of consumers. He points out that, if this continues, the capacity of the filters will be reached by the end of the present year. It is imperative, he says, either to provide more filters and pumps, or to check the waste; and as the draft averaged 191 gallons per head daily during the period covered by the report, he believes in the latter remedy. He states that an expenditure of $25,000 a year for meters will maintain an adequate water supply without distressing anyone; and the money can be furnished from the revenues of the Bureau without increasing the water debt.

Gas Workers' Union.—Mr. W. Thorne, the General Secretary of the National Union of Gas Workers and General Labourers of Great Britain and Ireland, in his report for the June quarter states as follows: "We have not been in a position to make any headway during the quarter, on account of the work in so many industries being very slack. The branch receipts were £5214 11s. 8d.; other receipts, £45 15s. 3½d.—total £5260 6s. 11½d. We have recovered a sum of £1344 12s. 9d. in compensation for our members; and the total amount now recovered stands at £14,642 3s. 4½d. We have spent £2927 17s. 6d. in dispute pay. This is the largest amount we have paid out during any given quarter for some considerable time, in consequence of having three or four large disputes on hand during the past quarter, and which I am sorry to say are still unsettled."

Rescued From Gas Poisoning.—Last Wednesday night a man (Mr. T. R. Phillips) and his wife, after sight-seeing in Liverpool all day, went to a boarding house in the city to spend the night—intending to start next morning for the Isle of Man. As they failed to appear at the breakfast table on Thursday, the servant went upstairs to waken them. As her repeated calls were unanswered, the bedroom door was forced open; and Mr. and Mrs. Phillips were found unconscious in bed. There was a very strong smell of gas in the room; and the occupants had been overcome in their sleep by the fumes. Both were removed to the Northern Hospital, where they were successfully treated for coal-gas poisoning, and during the morning recovered consciousness. It transpires that the light in the bedroom was put out; but subsequently Mrs. Phillips told her husband that she could smell gas, and he got out of bed with the idea of making sure that the gas was off. Being drowsy at the time, however, he must have turned the tap on by mistake.

It has been estimated that the construction of the dams in connection with the Derwent Valley water scheme will use up nearly 2,000,000 tons of stone, and that when the work is begun 700 tons a day will be required to keep it going.

The Electricity Committee of the Manchester Corporation have accepted the tender of a Berlin firm for the switch equipments of the Stuart Street station and the 15 sub-stations to be established. The sum involved is not far short of £50,000.

At the meeting last Friday of the Geltsdale Water Committee of the Carlisle Corporation, Mr. F. P. Dixon was appointed Chairman in succession to Mr. J. Corbett, for the remainder of the municipal year, and his name was added to the Sub-Committee.

The "Local Government Journal" has been publishing a series of articles on "The Planning of Buildings for Public Purposes," by Mr. George H. Bibby. The one in the current number (the 26th of the series) is on "Gas-Meter and Weights and Measures Testing-Stations."

The annual report of Mr. Alfred Spencer, the Chief Officer of the Public Control Department of the London County Council for 1900-1901 states that 1124 licences to keep petroleum (including 78 to keep carbide of calcium and 16 to keep both petroleum and carbide) were issued during the year.

The whole of the 300 omnibuses of the Atlas and Waterloo Association Bus Company are to be lighted by the Lewis acetylene gas. The lamp to be used will not only light up the interior and footboard of the vehicle, but project its beams ahead; thus serving the purpose of the usual inside and outside lamps.

The Lydd Gas Company have entrusted Messrs. W. C. Holmes and Co., of Huddersfield and London, with the execution of the whole of the contracts for extensions at their gas-works. The firm have also received orders for the erection of their patent "New" scrubber-washers at the Morley, Morpeth (second order), and St. Mary Church Gas-Works.

At last Wednesday's sitting of the Bangor (Co. Down) Court of Petty Sessions, Mr. James Bowman, Chairman of the Urban District Council, was fined 20s. and costs, for acting and voting as a member of the Council while disqualified by reason of his having supplied bricks to the Leeds Fire-Clay Company, the Contractors for the Council's gas extension works. The case was brought under the Local Government (Application of Enactments) Order, 1898.

A dispute has just been settled at Sunderland in a manner probably unique in the history of Trade Unionism. A number of men were engaged to paint and varnish the interior of Christ Church, the most fashionable church in Sunderland. They declined, however, to continue working last Tuesday morning, because women had been engaged in cleaning and scrubbing the seats. The Master Painters' Association thereupon held a meeting, and decided to do the work themselves. Fourteen of them then went to the church, and did the whole of the work in first-class style in a few hours.

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WANTED, at once, an Experienced SERVICE LAYER, used to locating Leakage. Apply, by letter, to the GENERAL MANAGER, Gas Works, MILL HILL, N.W.

JUNIOR Assistant Wanted. Used to Gas Company's Books and Accounts, and conversant with the routine of a Gas-Works. Wages 23s. per week.

Apply, with *copies* of recent Testimonials, to Mr. C. V. BENNETT, Gas-Works, HERNE BAY.

MECHANICAL Engineer Wanted as MANAGER, with experience in the Gas Branch preferred.

Send application, with short Statement of Experience. *Copies* of Certificates, Salary expected, and when free, to A. B. C. 129, care of DEACON'S ADVERTISING OFFICES, Leadenhall Street, LONDON. Gentlemen without practical experience as Manager or Assistant need not apply.

CITY OF BIRMINGHAM.
(GAS DEPARTMENT.)

GAS-FITTERS WANTED.

APPLICANTS (under 40 years of age) must be fully qualified, used to fixing Wet Meters, and accustomed to all classes of Compo. and Iron Pipe Work, Stoves, and Chandelier fixing.

Sample Meter Joints must be made by Applicants prior to engagement. Permanent employment for suitable men. Wages, 8d. per hour, rising to 8½d. at end of three months if work and conduct satisfactory.

Apply, with *copies* of Two recent Testimonials, to FITTINGS SUPERINTENDENT, Gas Offices, BIRMINGHAM.

SHEFFIELD UNITED GASLIGHT COMPANY.

THE Directors of this Company require a SUPERINTENDENT for their Grimesthorpe Gas and Chemical Works.

The present maximum make of Gas is 5 million cubic feet per day; Sulphate of Ammonia, about 3000 Tons per annum; and Sulphuric Acid, about 2500 Tons per annum.

Salary £300 per annum, with House, rent free.

Applications, marked "Superintendent," stating Age and Previous Engagements, to be made by letter only, addressed to the undersigned, not later than Friday, September 20, 1901.

Testimonials not to be sent till asked for.

HANBURY THOMAS,
General Manager and Secretary.
Gas Offices, Commercial Street,
Sheffield, Aug. 30, 1901.

THE LEEDS FIRE-CLAY COMPANY, LIMITED.
(GAS ENGINEERING AND CONTRACTING DEPARTMENT.)

THE Company require the Services of a thoroughly competent MAN to TAKE CHARGE of this Branch of their Business.

He must be practically conversant with the best and most recent methods of Gas Manufacture, and all the Machinery and Appliances in connection therewith, from the erection of Retort-House, Settings of Retorts (inclined and others), and all the necessary Iron and other work, up to the Gasholder.

His duties will lay principally in the soliciting and negotiating of Contracts, and the carrying out of the same to a successful and satisfactory completion.

Talent, energy, and determination are the characteristics required; for these the Company are prepared to pay. Remuneration may be by Salary entirely, or Salary and a percentage of the profits earned.

Apply, in writing (in confidence), giving full Particulars of past Experience, Age, Salary, with References, to the above COMPANY, No. 20, Park Row, LEEDS, marked "Gas Engineer."

OXIDE OF IRON OF FINEST QUALITY.

BALE'S Special Fire Cement should be used to keep Retorts, Furnaces, &c., in good repair during the heavy Winter Work.

Send for full Particulars to
BALE & CO., 120 & 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."
Telephone "277 HOLBORN."

JUNIOR Clerk wanted in Gas and Water Company's Office. About 25 miles from London. One accustomed to the work and a shorthand writer preferred.

Write, stating Experience, Salary required, &c., to GAS, 54, NEW OXFORD STREET, W.C.

WANTED, a good Water-Works PLUMBER (Registered preferred), one who has had experience with Waste and Consumer's Meters. Must be a good Main and Service Layer.

Apply, stating Age and Wages required, to ARTHUR GRAHAM, Gas and Water Engineer, MANSFIELD.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY Gas Engineer, Thornhill, DEWSBURY.

TO BE SOLD—

GASHOLDER (with Wrought-Iron Tank), 30 ft. by 12 ft. Cable Guided. New in 1895.

CENTRE-VALVE, 15 in. diameter, by Walker, for Four Purifiers.

Four PURIFIERS, 10 feet square, in line, with Planed Joints, Walker Centre-Valve, Covers, and Traversing Crab Lifting Gear. Will be refixed equal to new.

Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

FOR SALE.

THE Ipswich Gaslight Company have FOR SALE two Armstrong's HYDRAULIC CRANES, with Pumping-Engine.

These Cranes are in good working order, and have been constantly in use for unloading Coals into the Company's works, but are now being displaced by larger Cranes.

Further Particulars may be had on application to the SECRETARY, Carr Street, IPSWICH. Inquiries invited.

PETERHEAD CORPORATION.
(GAS DEPARTMENT.)

TAR.

OFFERS wanted for 500 Barrels Boiled TAR; also for surplus TAR (boiled or raw) and SULPHATE OF AMMONIA for One Year ending the 15th of May next.

Further Particulars on application at the Gas Office.

GEORGE KEILLOR,
Manager and Secretary.
Aug. 21, 1901.

MALTON GAS COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of 3500 Tons of unscreened GAS COAL or D.S. NUTS, delivered at Malton Station in such monthly quantities, from now to the 30th of June, 1902, as may be directed.

Tenders, stating the price per Ton of 20 cwt., to be sent to the undersigned on or before Monday, the 9th day of September next.

The lowest or any Tender not necessarily accepted.

No Tender Forms issued.

HENRY TOBEY,
Secretary and Engineer.
Malton, Aug. 31, 1901.

URBAN DISTRICT COUNCIL OF MORECAMBE.
(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the above are prepared to receive TENDERS for the supply of 5000 Tons of screened GAS COAL, to be delivered on the Gas-Works Siding, Midland Railway, Morecambe, in such quantities as may be required from the 1st of November next.

Tenders, specifying the description of Coal, the name of the Pit at which it is raised, and the Terms for net Monthly Payments, are to be sent in on or before Wednesday, the 25th of September, 1901, endorsed "Tender for Coal."

The Gas Committee do not bind themselves to accept the lowest or any Tender.

WILLIAM DUFF,
Engineer and Manager.
Market Street, Morecambe,
Aug. 19, 1901.

TENDERS invited for 200 £10 Shares, fully paid, in the Firm of Kempson and Co., Limited, Tar and Ammonia Distillers, Pye Bridge, near Alfreton.

Tenders to be addressed to No. 3788, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Knutsford Light and Water Company invite TENDERS for their production of GAS TAR and AMMONIACAL LIQUOR for the Twelve Months ending August 31, 1902.

State prices for Liquor of 5°, 5½°, 6°, 6½°, and 7° Twaddel.

The Company do not bind themselves to accept the lowest or any Tender.

Tenders to be sent in on or before the 10th of September, addressed to the Chairman.

COUNTY BOROUGH OF BURY.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the removal of their surplus COKE—estimated quantity about 5000 Tons, to be removed between the 1st of October, 1901, and the 31st of March, 1902.

Forms of Tender and Conditions forwarded on application to Mr. H. Simmonds, Engineer and Manager, Gas-Works, Bury.

The Committee do not bind themselves to accept the highest or any Tender, or consider any Tender for a quantity of less than 500 Tons, and further reserve to themselves the right to allot the quantity offered in such quantities as they may think fit.

Sealed Tenders, endorsed "Coke," to be delivered to the undersigned on or before Saturday, the 14th day of September, at 9 a.m.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bank Street,
Bury, Aug. 23, 1901.

CORPORATION OF LEICESTER.

SULPHURIC ACID.

THE Gas and Electric Lighting Committee of the above Corporation are prepared to receive TENDERS for the supply of SULPHURIC ACID, made from either native Sicilian Brimstone, recovered Sulphur, or Pyrites.

Specific Gravity in each case to be stated. The price to include free delivery by rail into elevated Tanks, 27 feet high, at the Chemical Works, Aylestone Road.

Probable quantity, about 1800 Tons, to be delivered as required during the ensuing Twelve Months.

Tenders, addressed to Alderman Lennard, J.P., Chairman, and endorsed "Tender for Acid," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Sept. 7, next.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Aug. 24, 1901.

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

TO TAR DISTILLERS.

THE Directors of the above Company are prepared to receive TENDERS for surplus TAR, delivered at their Works into Purchasers' Tank-Waggons or Casks during Twelve Months from October 1 next.

Estimated quantity, 60,000 Gallons.

Tenders, endorsed "Tar," to be addressed to the Secretary, at the Company's Offices, Snakes Lane, Woodford Green, on or before the 17th inst.

The Directors do not bind themselves to accept the highest or any Tender.

F. SMALLBONE,
Engineer.

Sept. 2, 1901.

COUNTY BOROUGH OF SWANSEA, SOUTH WALES.

IMPORTANT ISSUE OF NEW ORDINARY AND PERPETUAL DEBENTURE STOCK OF AND IN THE SWANSEA GASLIGHT COMPANY.

MESSRS. JOHN M. LEEDER & SON have received Instructions from the Directors of the Swansea Gaslight Company to OFFER FOR SALE, by Public Auction, at the Hotel Metropole, Swansea, on Friday, September 6, 1901, at 2.30 for 3 o'clock p.m. precisely,

£20,000

NEW ORDINARY STOCK

(Entitled to 5 per Cent. Interest per annum), and

£6000

4 per Cent. PERPETUAL DEBENTURE STOCK

OF AND IN THE

SWANSEA GASLIGHT COMPANY.

Being part of the Additional Capital of the Company authorized to be raised by the Swansea Gas Act, 1898, and pursuant to the Provisions and Conditions therein contained.

Purchasers of the New Ordinary Stock, 1898, will be entitled to Four Months' Interest at 5 per cent. per annum as from the 1st of September, 1901, payable on the 4th of April, 1902; and Purchasers of 4 Per Cent. Perpetual Debenture Stock, 1898, to Four Months' Interest due, and payable on, the 1st of January, 1902.

Particulars, with Conditions of Sale containing all necessary Information, may be obtained on application to THORNTON ANDREWS, Esq., Secretary and Manager of the Swansea Gaslight Company, Oystermouth Road, SWANSEA, or to the AUCTIONEERS, 46, Waterloo Street, SWANSEA.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

Now Ready, Fcap. Fol., 28 pp., 2 Plates, and 43 Illustrations, Bound in Duplex Paper Cover, Price 2s. 6d. net, post free.

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ZURICH NEW GAS-WORKS.
By A. WEISS, Engineer of the Works.

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THOMAS DUXBURY & CO.,
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Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

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Telephone 1806.

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Manufacturers of
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QUOTATIONS ON APPLICATION TO
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CANDLE SAFETY LAMPS.

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MADE from Spent Oxide (free from Arsenic) and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

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Inquiries Solicited.

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
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Prices and Analysis of all the Scotch Cannels on Application.

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Prices and Analysis on application.

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RAVENSTHORPE, NEAR DEWSBURY.

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Asbestos Spinners and Manufacturers.
Telephone No. 950. Tels.: "ASBESTOS, BRADFORD."

If you have no prejudices in the way of Non-Conductors for your Boilers and Steam-Pipes, consider our Trade Makes,

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They are Good, Better, Best. Ask for No. 4 Catalogue.
Applications for Colonial and Foreign Agencies desired.

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Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

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MANUFACTURERS OF
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STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACK ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

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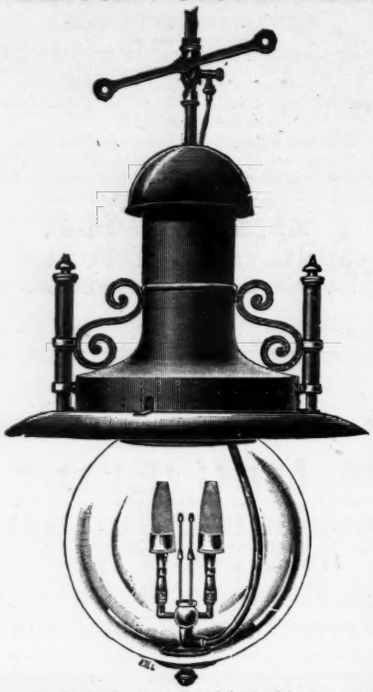
THE PATENT

"BEACON" GLOBE LAMP.



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NITRATE of Thorium and Cerium,
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HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

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WELDON MUD
FOR
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For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

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Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
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Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
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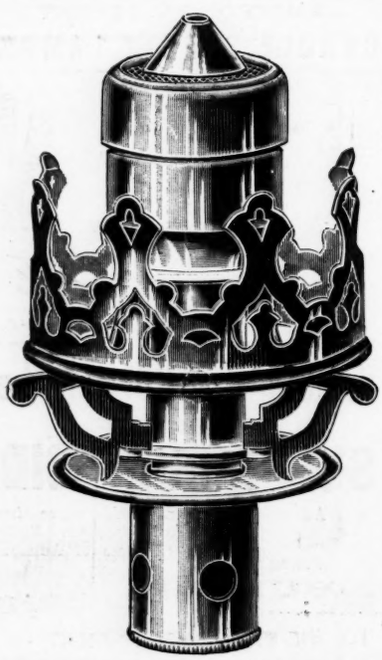
There is no Patent in the Bunsen Burner.

Comparison is Challenged with Rival Company's Goods at treble the Price.



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Steatite Top. Original Size.
Unexcelled for Quality, Durability, and Light.

PRICE 7/6 PER DOZ.

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By THOMAS NEWBIGGING, M.Inst.C.E.

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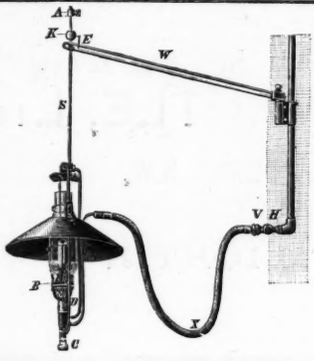

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"INDUSTRINA" Swinging Bracket for

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British Patents, Nos. 14,494/00 and 2040/01, German Patent No. 120,092 and others.

Lamp suspended in a Perfect Anti-Vibratory Manner. Easily adjustable in EVERY direction. Best thing for Lighting with Incandescent Burners.

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Made of the Best Charcoal Annealed Tinned Iron of EXTRA THICKNESS and Heavily Tinned.

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All sizes over 100 lights are made with Side Flanges as shown in Illustration.

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No Restrictions as to the Burner to be used.

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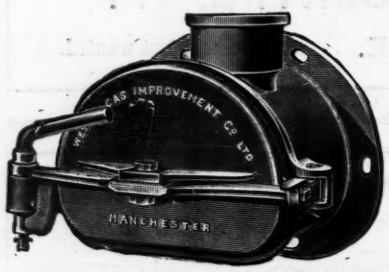

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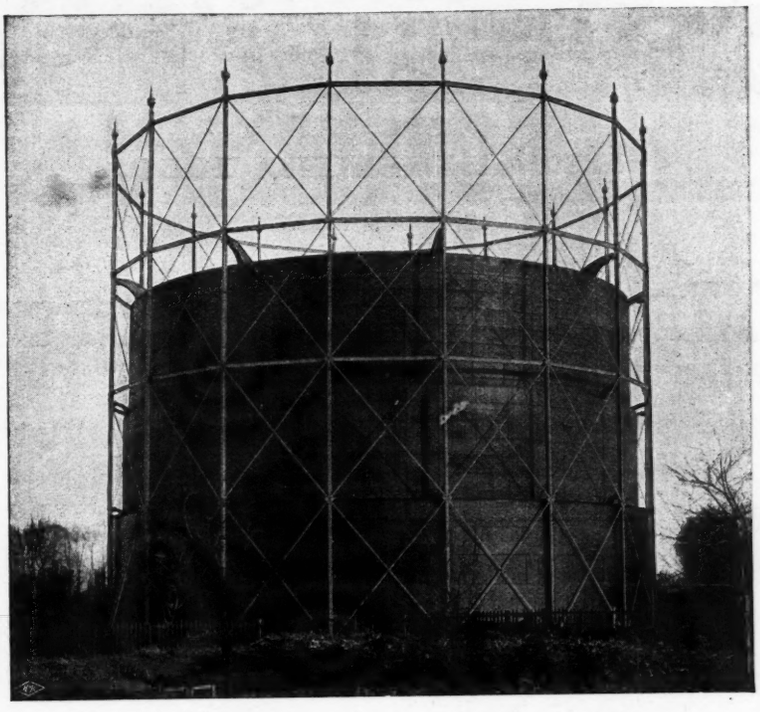
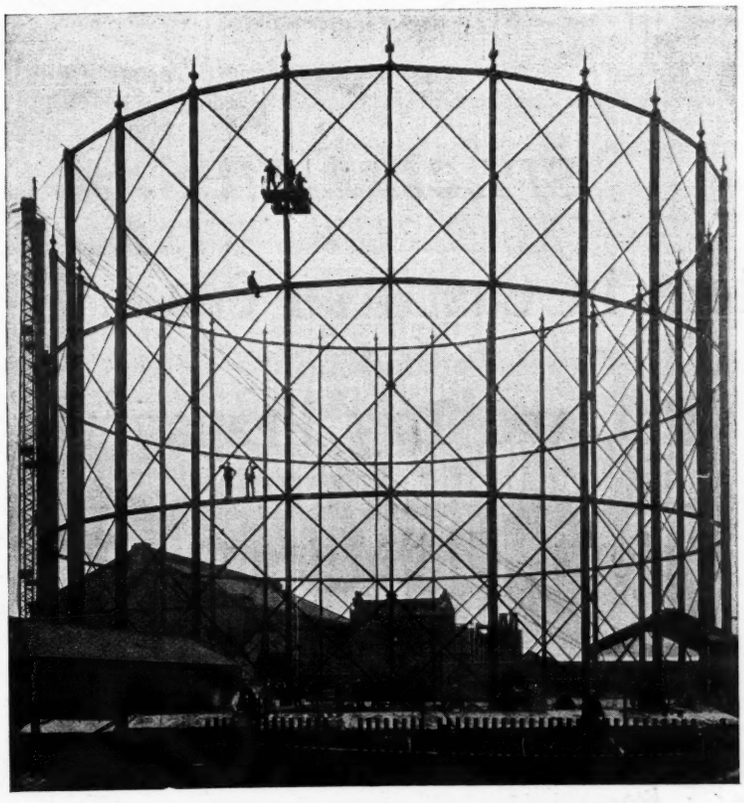


Three-Lift Gasholder and Steel Tank, 90 feet diameter by 14 feet deep, recently erected for the EPSOM GAS COMPANY.



Three-Lift Gasholder, 145 feet diameter by 35 feet deep, in course of construction for the WANDSWORTH & PUTNEY GAS COMPANY.

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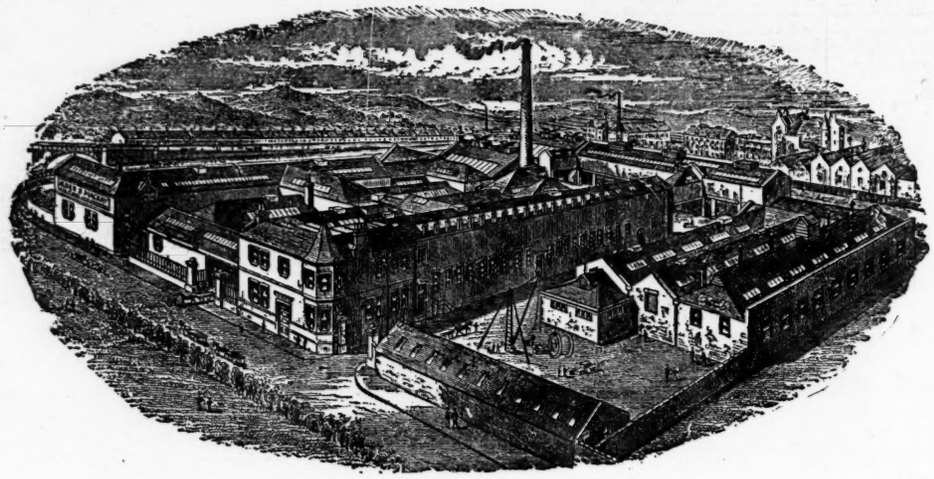

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Dry Meters in Cast-Iron Cases.

Wet and Dry Prepayment Meters.

Green's Patent Underground Wet Meters.

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SELF-INTENSIFYING LAMP.

Automatic Action.

No Complex Mechanism.

"Power" Free of Cost.

TYPE OF SCOTT-SNELL LAMPS
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INTENSIFIED LIGHT

WITHOUT Compressing Plant, Special Gas-Service, Water Bill, Gas-Engine or other Pumping Appliances, tearing up of Roadways, or interference with existing Service.

The **SCOTT-SNELL LAMP** may be set to give any pressure from 4 inches to 36 inches of Water; 8 inches to 10 inches is usually preferred.

Lanterns supplied with Single, Duplex, or Cluster of Burners.

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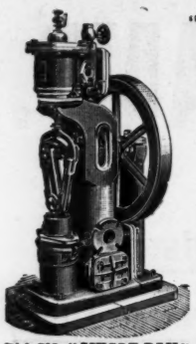

Fig. 706. "SINGLE RAM" STEAM-PUMP.

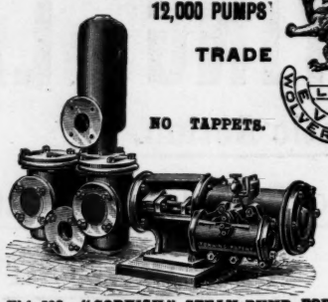

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

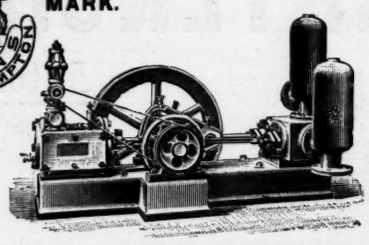

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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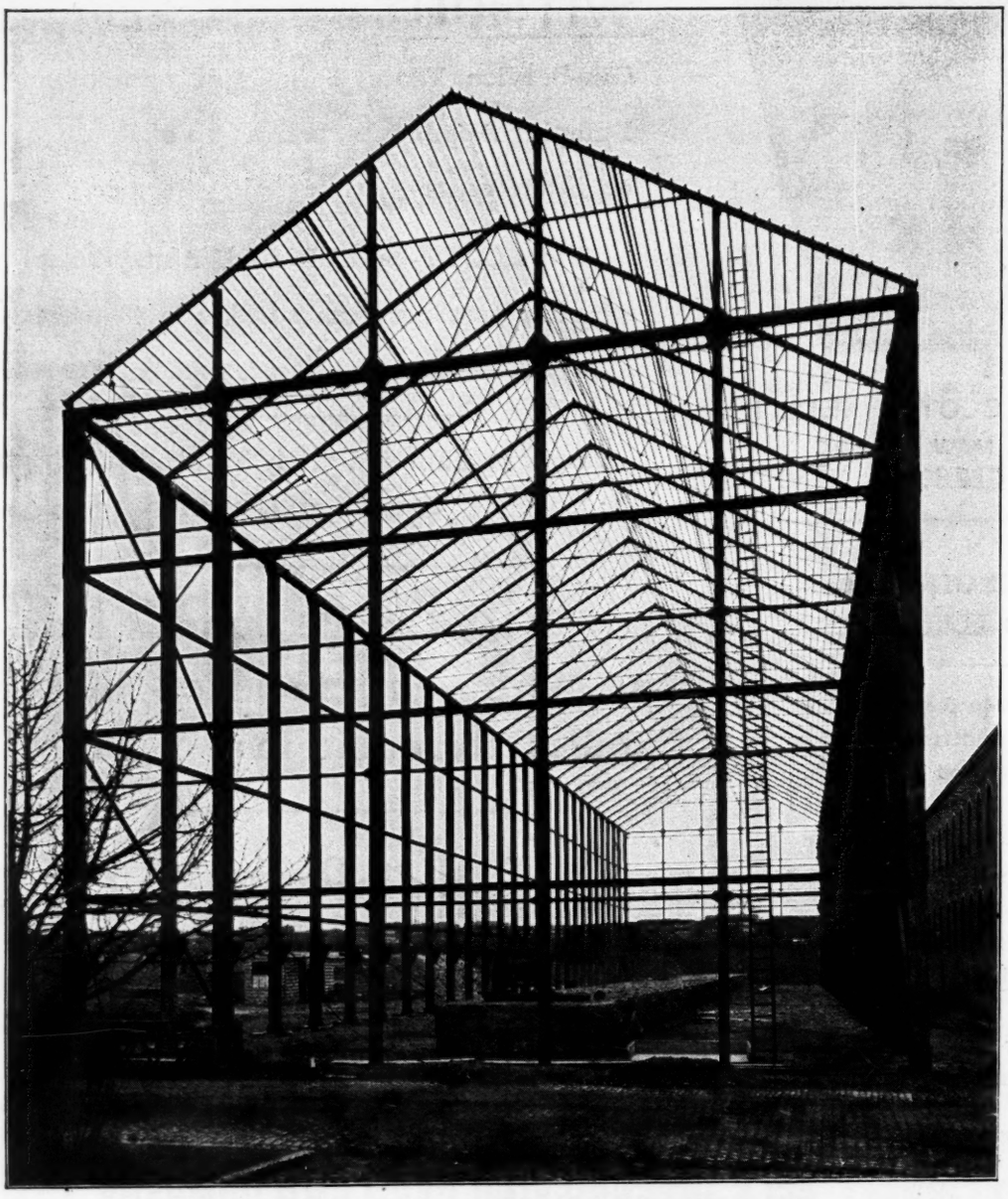

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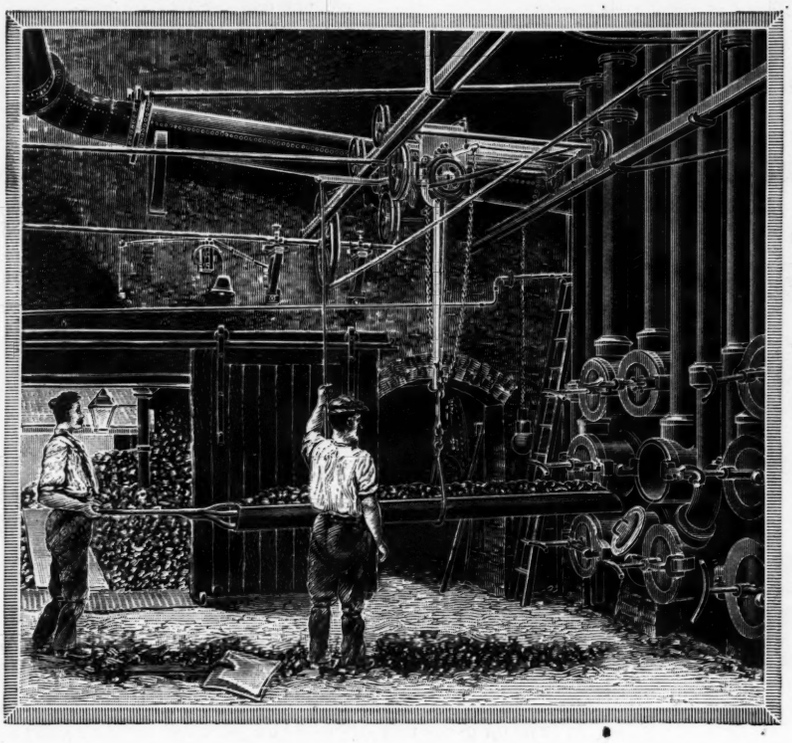

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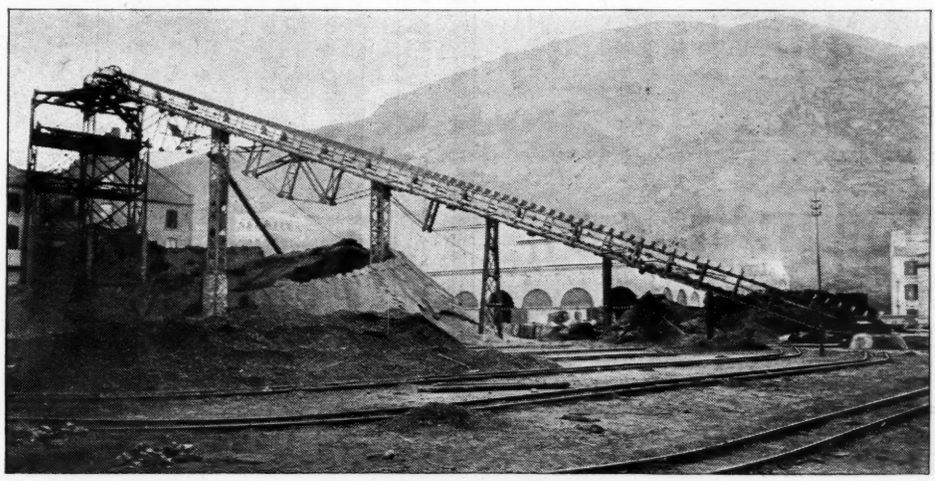

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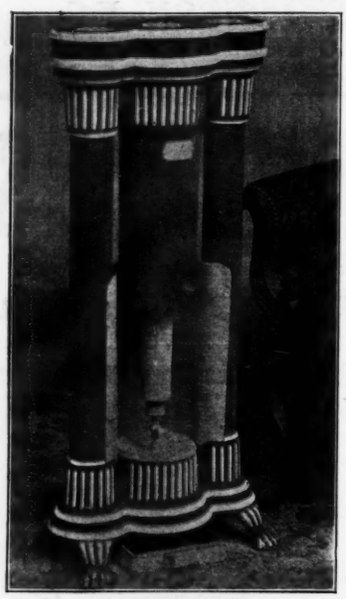

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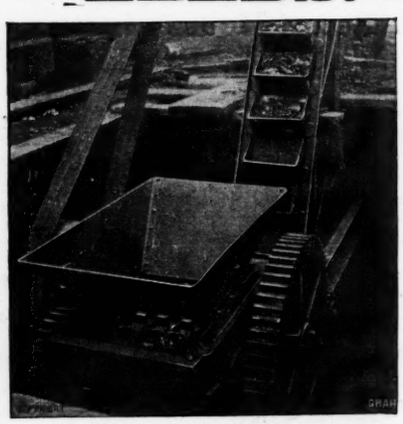

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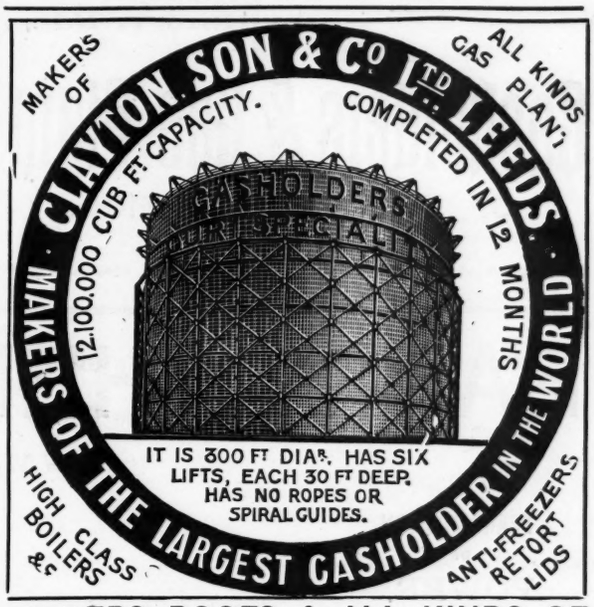
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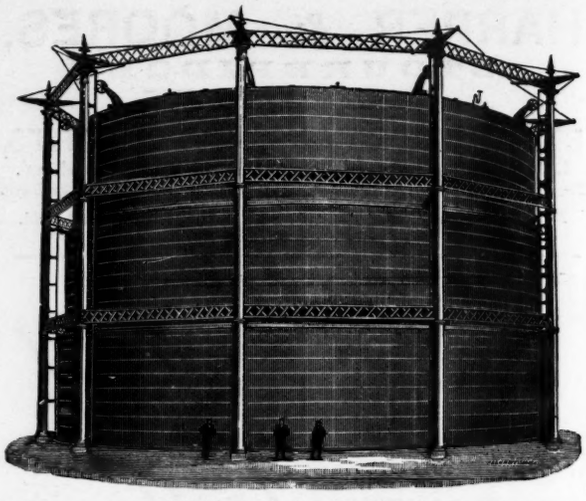

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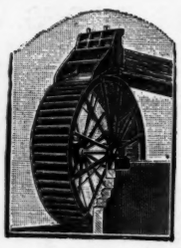

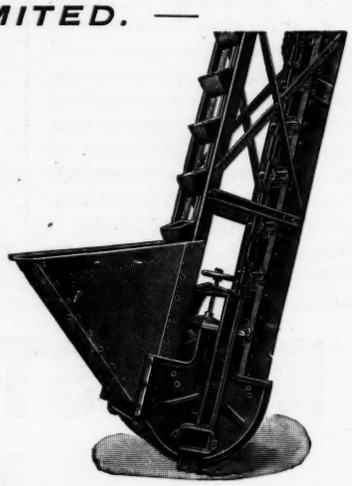

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